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Industry Steadfast in the Crisis

THE business community has kept its head wonderfully well during the European crisis. It has set a fine example of calmness, courage and realism, while the war-mongers have been tumbling over each other like a panic-stricken mob. After all, British industry and commerce would be the first and the worst sufferers if this country were so badly guided as to be led into a general war. The politicians would still be with us, with their theoretical axes to grind. There would be a revolution over-night in the world of business affecting the lives and fortunes of the overwhelming majority of the population. Fortunately, in the long run the shrewd common sense of the man who has to make a living in competition with his fellows prevails over the sentimental and unpractical clamour of the politically-minded minority.

If the politicians make the most noise in times of difficulty and danger, the influence of the business man and artisan, more particularly outside the London area, is felt as a far more formidable factor in steadying the national position. It is clear that the great mass of British opinion, sober and unexcited, is against engaging in war for any cause less than the defence of the vital interests of the Empire. It does not regard the problem of Czechoslovakia as coming within this category, and it is silently, but very perceptibly, ranging itself behind the Government in seeking an accommodation which will avert a general conflict. That is not to say that the actual plan evolved by the British and French Governments is accepted as anything but a bitter pill. Still the British people as a whole have the good sense to realise that the present crisis springs from a thousand years of Continental history, culminating in the territorial blunders of the Treaty of Versailles, to which their Government's signature was attached. If there had to be the fateful choice between peace and war, British opinion, and ranged behind it the opinion of the Empire at large, was decisively against war.

So, notwithstanding the angry protests of the politically-minded minority, Mr. Chamberlain has secured national support for his policy of peace in our time. He could not have made his dramatic visit to Herr Hitler and moved purposefully onward towards his goal, unless he had been buoyed up by the good will of industrial Britain, of which he has a more intimate knowledge than any of his predecessors in his high office since Sir Robert Peel. His lifelong experience in the business world, with Birmingham as its focus, has instinctively shown him the right way. He did not need to be told that there was no vestige of panic in the Midlands and the North. He knew quite well that the men and women, on whose activities the prosperity of Great Britain depends, were quietly getting on with their jobs and not making inflammatory speeches or writing hysterical letters to the newspapers. He received no news, because there was none to be sent him, of precautionary dismissals of staff or of the deferring of the signature of contracts ahead. British industry has maintained intact its long-term policy, and the only trace of nervousness that has appeared has been shown on the Stock Exchange, which is never a sure guide when national policy has suddenly to be re-assessed.

The position remains difficult, and there are many palpable dangers ahead. If, however, the world feels that the worst is over, it is largely due to the sound instinct of the British industrial and commercial classes.

The Value of Safety Education

THE number of accidents occurring in all classes of industry remain the cause for serious concern of the management and employees alike. Each year within recent times they have shown an increase over the previous year's figures; industrial activity has increased simultaneously, however, so that this is not altogether unexpected. In the chemical industry conditions are from one point of view surprisingly good. Remembering the nature of the work and visualising the terrible accidents that could conceivably happen, the accident rates could be thought satisfactorily low. Ever since chemical manufacture was first undertaken both employer and employee have, broadly speaking, realised the potential dangers of the work, and this has tended to keep the number of accidents occurring at a low level. But it cannot be gainsaid that the accident rate has grown over the last few years in common with the increase experienced in most branches of industrial enterprise.

The coming into force of the new Factories Act in July last was undoubtedly a valuable step forward. The revision of the law which it provided may have been long overdue, but in any event it introduced many major alterations to the safety provisions of the old law and a number of entirely new requirements. In addition to these important changes which it brought about, it also had the useful effect of promoting safety-mindedness through the attention which works management had to pay to its requirements and through the general publicity associated with its introduction.

The new Act can only operate successfully with the co-operation of the management and the workers. Year after year the annual report of the Chief Inspector

of Factories demonstrates that a very large proportion of industrial accidents are solely due to carelessness on the part of an individual worker. However closely the employer may follow the letter of the law in carrying out the safety provisions required, he cannot in this way safeguard against accidents due to this factor. In reality what may pass as carelessness at first sight may often be ignorance pure and simple; a young and inexperienced worker may cause an accident simply because he knows no better. This case can only be dealt with on the personal initiative of the employer; he is not forced by law to educate his workers in safety matters, but it is the only way in which the number of accidents can be very considerably reduced.

The safety education of a new and inexperienced employee should begin from the very moment that he joins the organisation. Before entering the works for the first time, it is best for him to be informed as simply as possible the chemical and physical nature of the processes being worked, how the reaction conditions are controlled, and at what values they must be maintained. Any liable sources of danger should be pointed out and they can be slightly overdrawn with good effect. It is better for the inexperienced worker to have rather exaggerated ideas of the danger of his work, than for him to have the general outlook that all the liquids in the works are almost as harmful as water and all the solids as inoffensive as chalk. Frankness on the part of the works manager, or safety officer, will engender that spirit of co-operation with the employee so necessary in matters of safety.

The set routine of production should be impressed upon the new hand with strict instructions never to alter the temperature, pressure and other reaction conditions from those prescribed for the process. Not that he should be discouraged from using his own initiative in thinking out some possible improvement, but that it must be mentioned to a superior and not just tried to see if it worked. The worker must know where the safety equipment, such as goggles and protective clothing, is kept and how and when they should be used, the positions of first-aid boxes, fire extinguishers and the like should also be made clear. The importance of keeping working places clean and tidy is of the first importance; if each individual worker can be persuaded to take a personal pride in the cleanliness of his working section it will show there is the right spirit for seeing that accidents do not occur.

Safety propaganda, such as posters, the display of the accident records of different departments, first-aid competitions, fire drills, etc., are a constant reminder to the workers. Moreover, they are sure to reach the most difficult men in the works who consider themselves too clever to be caught. Accidents are bound to happen now and again through a temporary forgetfulness on the part of even the most careful, but those due to inexperience or cocksureness can be eliminated by a progressive scheme of safety education.

Notes and Comments

Plant Accessories

FOR all chemical processes carried out on the manufacturing scale, the individual manufacturer has worked out the reaction conditions for optimum yield and purity of the final product. Although slight deviations from these conditions may not matter in some cases, in others it may result in a falling-off of yield, or the contamination of the material by the formation of by-products. The reaction conditions once standardised are, therefore, adhered to as closely as possible. Rule-of-thumb methods in their measurement and adjustment are, therefore, undesirable; this work can only best be done by instruments especially designed for the purpose. Instruments for recording, and often controlling, temperature, pressure, fluid flow, *p*H, humidity, and other conditions, although termed plant accessories generally, are of vital importance to the successful operation of the process, and quickly pay for themselves in the working economies they effect. In the term plant accessories is also included safety devices for the prevention of accidents and equipment for use when accidents unfortunately occur. The present issue contains articles on both these two types of plant accessories and describes some of the new accessories which have recently been placed on the market.

The S.C.I. Autumn Meeting

THE autumn meeting of the Society of Chemical Industry, held at Glasgow over last week-end, was a highly successful affair, the papers read being of exceptional interest, arousing much discussion, and the social events most enjoyable. The only criticism which could possibly be made of the arrangements was the quality of the weather provided! The rain, which was almost continuous on the Friday, Saturday and Sunday, was quite unsuccessful in its attempt to dampen the spirits of the gathering. Most of the business side of the meeting was given over to a symposium on the trend of progress, and consisted of five introductory papers, contributed by members of the Food Group, the Road and Building Materials Group, the Plastics Group, and the Chemical Engineering Group, followed by discussions. One of the objects of the symposium, as Dr. Lessing pointed out, was to bring the four Groups together so that each may learn something of what is being done and, still more important, what is going to be done by the others. He believed that contacts between the Groups, such as those provided by the symposium, should be made from time to time, as there must be common points of interest and value. There was no doubt from the participation in the discussion that this object was successfully achieved. Abstracts of two of the papers, and the discussion upon them, are published in this issue. We intend to publish the remainder next week. Organised visits were paid to the Empire Exhibition, the party being split into a number of small groups, each being led by a guide. This was an admirable way of seeing the exhibits, for the ground was covered fairly rapidly. But even then it was generally felt that one would have to spend a whole week in the Exhibition grounds to see all the exhibits. The high-light of the social events was the Society's official dinner; it was a most enjoyable evening and mention must be made of Mr. J. M. Leonard's excellent film of the Canadian tour which was shown after dinner. All good things come to an end, and in this case they were terminated by a farewell party on Tuesday morning, given by the President and Council of the Society.

Instruments for the Operation of Chemical Plant

By
A. G. WRIGHT

CHEMICAL plant entered a new phase when instruments of control were adopted and recognised as being able to serve a useful purpose. Not only was the efficiency of chemical plant assured to a degree greater than at any time hitherto, but a special advantage was introduced from being able to operate the plant with a greater degree of safety. With the wide range of instruments which are now available, efficiency and safety continue to go hand in hand, and with the greater complication of plant and methods of operation this inter-association of efficiency and safety—attained by the use of instruments—has become even more desirable.

Reasons for Use of Instruments

The actual need for instruments arises in several directions. The use of heat and either pressure or vacuum demands that some measure of these quantities should be indicated and possibily recorded for future reference; the accumulated data so obtained can be studied to give more-or-less standard conditions for plant operation where particular results have to be attained. Following the introduction of plant which is operated continuously instead of intermittently, it has also become necessary to regulate the flow of materials passing from one part of the plant to another, that is from one unit operation, such as crushing, to another unit operation, such as the dissolving of the crushed material. Here, control instruments are again in demand, and since there is often a close relationship between the flow of materials and physical conditions at any one point on the plant it becomes even more important to record all such data with a great degree of accuracy, so that one feature may be recorded or indicated in definite relationship to another feature. Chemical plant which has no indicating or recording instruments is merely an assembly of laboratory apparatus on a large scale, with someone in attendance having a limited knowledge of what is actually happening in the vessels and pipes, and these vessels and pipes being made of metal instead of glass do not allow visual observation. It is, of course, easily possible to operate chemical plant without its due share of dials and devices, just the same as a simple distillation in the laboratory can be carried out without the use of a thermometer; exact conditions, however, cannot be repeated on a subsequent occasion of operating the plant, unless some measurement of the magnitude of physical conditions is obtained and recorded.

The successful operation of chemical plant, considered without particular reference to any unit operation, demands a knowledge of temperature, pressure (or degree of vacuum), rate of flow of liquids or gases, rate of flow of steam for heating or water for cooling, and such conditions as a change in density, the sudden evolution of gas or the development of froth.

Their Selection

The makers of indicating and recording instruments usually have a wide range of patterns from which to choose. It therefore becomes necessary to know the conditions attained in operating the plant and the extent of their upper and lower limits. Plant conditions often vary so widely that there is definite need for a wide range of instruments. This wide range is sometimes confusing to the user, but it must be remembered that even laboratory thermometers are of several patterns, each suited to different conditions of usage and temperature range, and plant conditions on an industrial scale have a greater tendency to fluctuate and therefore require careful measurement. The makers of these instruments have good knowledge of what they will do, and it is therefore desirable that they (the makers) should be allowed to choose the instruments on the knowledge of the precise needs of the prospective user being laid before them. If the user wishes to make his own choice he will not necessarily be at a disadvantage, because the instrument makers issue catalogues and leaflets in which operating principles are explained in great detail, with particulars for different sizes and patterns alongside notes of what each instrument has been designed to do under practical conditions.

Nearly all plant instruments are now obtainable in the form of patterns which record as well as measure. In some cases a controlling mechanism is also introduced so that the plant may be entirely automatic, that is, independent of external means for meeting contingencies. All users of instruments are recommended to take advantage of this. Where the initial cost can be met without difficulty it is advisable to install a recording pattern rather than a mere indicating one; the general utility of this becomes apparent after the instruments have been installed for a considerable time and an accumulation of record charts is available for study. The data which is given on these charts will have much to tell about difficulties which may have arisen in the course of a lengthy period of operation of the plant, and possible unforeseen circumstances liable to cause trouble can often be detected before the trouble really becomes serious. In certain cases the charts will provide data for computing costs of manufacture, and will equally well indicate whether or not each part of the plant is working at a capacity which is satisfactory to preceding and succeeding operations. Overloading of any one part of the plant is thereby avoided, and equally so can a lagging in speed or efficiency be detected. It is, indeed, difficult to realise the operation of a continuous plant without the use of instruments for measuring and recording the physical variables, together with a certain useful proportion of control devices operating direct from these instruments.

Tendencies in Design

It is difficult to give precise details of all the different patterns of instrument which are available for use. So much depends upon the actual situation in which they may have to be used, quite apart from limitations of range. The manufacturers of the instruments are regularly making minor improvements and adjusting the general form to make them more convenient in special circumstances. During the last few years, however, considerable attention has been directed towards attaining greater accuracy in measurement combined with a greater degree of sensitiveness, so that the instrument responds to fluctuations with a rapidity which serves all the needs of controlling devices. Recording patterns have now completely overshadowed the mere indicating instrument, and an endeavour has been made to produce records in a form which requires the minimum amount of interpretation for the better operation of the plant—not only after the chart has been removed from the instrument, but also in an immediate sense. In many cases, two or more variables can be recorded upon the same chart so that their exact relationship becomes immediately apparent. Instruments which can be switched on in turn to a number of points, for instance to give temperatures throughout a system of pipework or for each of a number of individual and similar vessels, are also being improved and more widely adopted, distance indicating patterns being much in demand. A certain refinement in the mere indicating patterns has centred around the matter of giving a clearer indication from a distance, so that those in charge of a plant can keep their eye upon any fluctuations whilst attending to other matters, such as the closing of a charging hole or the operation of valves.

In some cases not only have controlling devices been coupled with the recording or mere indicating instruments;

the peculiar needs of certain types of plant, or the whims of their users, has demanded the incorporation of some form of alarm to give notice that limitations of desirable range for a particular variable has been reached, not necessarily from the point of view of safety, but rather as a warning to give attention to other parts of the plant.

All instruments, irrespective of whether they are mere indicating, recording or controlling patterns, need to be kept in perfect working order if their accuracy is to be maintained. Unforeseen circumstances may throw the instrument slightly out of balance or give it some form of strain, in spite of the great care which is exercised in manufacture, and unless this is detected at an early stage the readings may be of serious concern in the operation of the plant. It is therefore desirable that instruments be checked for accuracy at regular intervals, preferably by arrangement with the makers, who will then be able to make any slight adjustments which are found to be necessary. No instrument is so perfect under all conditions of usage that it will continue to give true readings indefinitely; circumstances which give rise to a period of slight inaccuracy cannot easily be detected unless the actual instruments are tested, and although a particular instrument shows no sign of failure over a long period of time—in the course of which it has been frequently tested—it should not be assumed that the expense and trouble of testing has been unnecessary. In the case of certain types of instruments the checking of accuracy can be done by the user, but it should be emphasised that any adjustment must be left in the more experienced hands of someone from the instrument makers' works.

Research in India

Work of the New Industrial Bureau

ACTIVITIES in connection with magnesite, magnesium and dry ice, artificial silk, paints, starch, dry cells, vegetable oils, calcium carbide, electric lamps, glass and glass materials, and many other industries of special interest to India are described in the annual report of the Industrial Research Bureau of the Government of India for 1937-38. The bureau was established on the recommendation of the Industries Conference on a temporary basis in the first instance for three years, to develop Indian industrial research, and the present report surveys the third year of its working. The Government of India have placed the bureau on a permanent basis from March 1, 1938.

The list of bulletins on Indian industrial research is becoming daily more comprehensive and interesting. Heavy chemicals, purification of clay, Indian vegetable oils, manufacture of sulphitation sugar from coloured canes, and the soap industry have been covered this year. Papers on leather tanning and on rape and mustard seed oil are in course of preparation. As a result of a competition announced in November, 1937, twenty-one papers on industrial research have been received.

In view of its economic value to the country and its connection with agriculture, the co-ordinated survey of the oil-seed crushing industry, which is being arranged jointly by the oil-seed producing provinces and states and the bureau is of special interest. There is urgent need for the improvement and development of this industry, as it is most desirable to encourage the export of oils rather than the seeds, and to retain and utilise the oil cakes in India. Surveys of the tanning and of other specified industries are planned to be taken up subsequently. The manufacture of starches might become an important Indian industry, as there is abundant supply of vegetation suitable for starch manufacture. It is proposed to issue a technical note on the subject shortly.

A considerable amount of valuable research and development work has been carried out in connection with the improvement of glass pot furnaces, glass melting pots, and glass making sands.

Society of Chemical Industry

Official Dinner at Glasgow

ABOUT 200 members and guests attended the official dinner of the Society of Chemical Industry, held at the Grosvenor Restaurant, Glasgow, on Monday, with MR. W. A. S. CALDER, deputy-president, in the chair. Proposing the toast of "Glasgow," Mr. Calder said that he was very pleased that Sir Cecil Weir, chairman of the Empire Exhibition Executive Committee, was able to be present and would like to say how much the members of the Society had enjoyed his great exhibition, in spite of the weather rendering no assistance!

To many of the members the Empire Exhibition had been a revelation of what could be done in the way of organising an exhibition, and he was certain that one of the very pleasant memories which they would take away with them was the reception in the marvellous Art Gallery, when the Society was received by Lord and Lady Elgin. The Society was greatly indebted to the members of the Glasgow Section, who had made the visit so delightful, and especially to Dr. I. Vance Hopper and Mr. W. J. Skilling, who had been indefatigable in all their efforts.

SIR CECIL WEIR, responding to the toast, said that he was sorry Lord Leverhulme was unable to be present for he wished to thank him for the great service he had rendered to the exhibition in sending 10,000 of the employees at Port Sunlight to visit the exhibition. One of the greatest satisfactions of the exhibition had been the large number of conferences which it had been possible to hold there. This had brought a great many distinguished people to the city, and he hoped their visits would be of benefit to Scotland.

Mr. H. J. Pooley, general secretary of the Society, then read messages which had been received from the two presidents, Viscount Leverhulme and Mr. Victor G. Bartram. The toast of "The Presidents" was proposed by Dr. I. Vance Hopper, chairman of the Glasgow section.

Following dinner, and before the dancing, Mr. J. M. Leonard showed an excellent film, largely in colour, which he had taken during the Society's Canadian tour.

Waste Pickling Liquor

Production of a Useful Material

THE production of a commercially valuable material from waste pickling liquors is described in *Chem. Met. Eng.*, 1938, *45*, 430. The liquor is (presumably) oxidised and treated with lime, whereby a precipitate of calcium sulphate and ferric oxide is obtained. During the dewatering of this precipitate, a plastic mass is obtained which can be moulded to any desired shape.

The material dries to a hard porous substance, of a light tan colour, which has been given the trade name of "Ferron." This material is remarkable for its high thermal insulating value and the ease with which it can be machined, sawed and drilled. It has 5½ times the insulating value of an equal thickness of plaster, and 15 times that of brickwork, and is about as good as 85 per cent. magnesia, being able to withstand a higher temperature—900° F. instead of 600° F. There are many obvious fields of application. Up to the present it has been employed in the manufacture of wallboard and pipe coverings, for which it is ideally suitable. An interesting property is its ability to absorb hydrogen sulphide from the atmosphere, so that silver articles laid on it will not tarnish.

IT is reported that production of borax and other boron compounds is to be started by the St. Gobain concern in association with the firm of Arnault & Vandierdonck, of Chauny, France.

Chemical Works Safety Needs Continuous Attention

By
"CONSULTANT"

SAFETY is a subject which needs consideration from two distinct aspects, either of which applied singly can only be partially effective. On the one hand, there are general questions which demand attention as a matter of organisation on the part of the owners of the plant; on the other hand, matters which depend almost entirely upon the individuals who are operating the plant.

Chemical engineers have already formulated certain types of safety rules which apply to plant generally and to particular groups of plant according to the nature of the operation which is being carried out. For instance, measures which have to be adopted in cleaning out vessels liable to contain poisonous or explosive vapours were one of the first matters to receive attention; these were followed by special safety rules applying to tar stills, to stills of all types generally when in operation, and so on. In this connection much useful work has been done by the safety sub-committee of the Association of British Chemical Manufacturers, who prepared and published a set of model safety rules for chemical works, and have also issued to their members more detailed considerations of safety so far as particular types of plant are affected, arising mainly as the result of some hazard which has come to light in the chemical industry.

Safety in Large and Small Works Compared

Large works have one outstanding advantage over small works so far as safety in the chemical industry is concerned. With a large number of employees it is possible to appoint a special full-time safety officer to make regular rounds of inspection throughout the works, giving advice to employees when special occasions arise and as a matter of routine from time to time, and generally keeping in touch with the subject of safety in other parts of the industry with the object of gathering information to apply to those under his own charge or for the benefit of the industry generally. Large works are also in a better position to obtain useful ideas from their employees, one of the workmen being elected to represent his fellow workers on the works safety committee. With a greater number of employees, however, there is also a correspondingly greater risk of dangerous conditions or practices arising, owing to variations of the individual. A small works may be in the advantageous position of having all the employees so perfectly safety-minded that accidents do not happen, and as the individuals see no need to increase the safety factor certain ideas in embryo are never developed.

A large number of accidents arise from the carelessness of the employees; this is confirmed by any of the annual reports of the Chief Inspector of Factories, who, year after year, continues to make reference to casualties arising from the dropping of articles, by falling from ladders, and by leaving tools and ladders and also pieces of machinery in awkward positions to the danger of fellow employees. Simultaneously, there are cases where employees persist in doing things which they know to be dangerous; for instance, exposing themselves to the danger of moving machinery inside the space normally protected by guards, or by making slight adjustments to machinery under difficult circumstances without taking the precaution to stop the machinery. Sheer laziness can also be the cause of accidents, and in other cases there may be a general acceptance of dangerous conditions with contempt for them or their mere acceptance as conditions of the work.

To search in another direction, namely, that of the responsibility of the plant executive, it is possible to trace some accidents to the provision of make-shift devices, possibly at first justified to save expense while an idea is under trial for a few days, but which is eventually adopted for permanent use on make-shift lines. Plant executives may also be lined up with the employees on a charge of carelessness. Neglect to test various pieces of plant which require testing at intervals, either frequently or after being in use for a year or more, is the chief crime. Because a steam-heated jacketed-pan has been designed to work at some definite pressure and duly tested and used at that pressure for several years without hint of unsafe conditions, it does not follow that the pan will continue to act satisfactorily for twenty years or more. Nevertheless, it has been known that steam pans have been in operation at chemical works for this number of years without having been once tested since the day when they were first installed, and possibly neither inspected from the most casual aspect.

Danger of Corrosion

The persistence of corrosive conditions is sooner or later likely to give rise to dangerous conditions. Unsuspected corrosion at the bottom of a large tank may develop into a serious leak at some unexpected moment, not only with a risk of injuring employees by direct contact with acid but also dangerous from the aspect that the flow of some liquid or solution to another part of the plant may be restricted or temporarily cut off and abnormal working conditions result. Regular inspection will rarely fail to detect circumstances of this type, but the inspection must be thorough as well as regular and tanks which are raised slightly from the ground must be given special attention from their underside even when inspection may be difficult. Here is an instance where plant layout has its effect upon safety, because by careful forethought every part of the plant can be made accessible for inspection and repairs. To cramp the housing of a plant in a confined space in order to economise upon pipework, or to save a few square feet of floor space or a few inches of head room, is very false economy. If time sheets for repairs and maintenance are carefully analysed it will be found that there is no gain financially in the end, and there certainly is no added factor of safety or reduced conditions for accidents to happen.

Valves and pipe joints must receive their due share of inspection throughout the year, but pumps demand a continuous vigilance. A pump which is running badly can be an extreme source of danger, either as moving machinery or from possible leakage at the gland. Manhole joints and sight-glasses on large vessels also need regular inspection, and if the vessels are provided with agitating gear there is another possible source of leakage at the gland through which passes the stirrer shaft. Here again the provision of agitating gear and belt-shifting gear on the top of a vessel needs to be considered, so far as the work of employees may bring them close to bevelled gears and moving belts. Where a battery of large autoclaves are served by one common platform traversing the entire length of the battery, the belts operating stirring gear on each of the vessels must be run from a shaft under such conditions that they offer no inconvenience to individuals moving about the platform.

Commonsense Rules

There are, of course, a number of general rules which are applicable to all employees of a chemical works with respect to safety. For instance, fire precautions make it essential to keep sacking, cotton waste, and other inflammable material out of contact with hot pipes and vessels; indeed, with regard to rubbish of an inflammable nature it is desirable to provide special bins in which such rubbish may be deposited. A large leakage of some inflammable liquid will make it necessary to shut down any fires or gas burners beneath near-by stills and other equipment. Fire-fighting appliances have not only to be provided, but employees who may need to use

them should know exactly how to use them; it is also desirable for employees at danger stations to be sure that a fire extinguisher is to his own satisfaction in good working order. Fire-fighting must be done with a knowledge of certain elementary facts, namely, that water is used for extinguishing wood, tar and pitch; foam is used to extinguish all fires caused or fed by an inflammable liquid of the nature of oil or benzole; and sand is used to prevent a fire from spreading. Special fire extinguishers of proprietary type are necessary for fires which arise in electric motors or electric cables, and for all small fires considered generally.

Reporting Faults in the Plant

With regard to the process itself first considerations of safety demand that the plant employee reports any faults in the steam supply or electric current, any leaky joints upon vessels or pipe-work, and any slackness or undue wear of driving belts and chains. A suspicion of gas or vapour causing difficulty in breathing or giving rise to dizziness, no matter how slight, should be reported immediately. Stills, tanks and closed spaces generally must not be entered without a permit obtained from someone who is authorised to give it after ascertaining that conditions are safe; an exception, of course, may occur where an employee engages in rescue work at some unforeseen moment. The cleaning out of pipes, tanks, pump casings, etc., requires any accumulated deposits to be kept wet with water and removed to a point of safety away from other plant which is in operation; this precaution is emphasised especially in the case of tar by-products works. For stills it is desirable to make a regular inspection of the safety valves which are fitted. Valves controlling the steam supplies for such stills, and also gas-burner taps, should be examined at frequent intervals to ascertain that they can be closed without difficulty should emergency conditions arise. As another precaution portable lights should not be run from a lighting circuit, except in special circumstances.

Personal safety on the part of the employee must not be overlooked. If he thinks that his job needs some form of protection by goggles, gloves or rubber boots, he should ask advice from the process foreman, and if conditions warrant an issue the employee should not merely have them, but should use them. Goggles must be worn where there is a danger from hot liquids or corrosive liquids; for instance, in handling sulphuric acid, caustic soda, tar acids, hot oils and hot tar. Precautions should be taken to prevent oils from splashing the clothes or the skin; not only may inflammable conditions arise, but there is also some risk of setting up skin troubles if cleanliness of clothes and body are not kept in mind continuously. Injuries, however small, should receive proper attention.

An Example of Safety Practice

Special rules which are applicable to plant engaged in the distillation of benzole may be considered in greater detail as an example of safety practice. Here residue tanks must be kept empty in order that stills may be run down in case of leakage. Stills, moreover, must not be charged until a period of one hour has elapsed after discharging. Air pressure, when used for blowing liquids (excepting acids), should not be greater than 20 lb. per square inch. Stills, fractionating columns, condensers and receivers, must always be steamed out before being opened for inspection or to execute repairs; under like conditions steam pipes and benzole pipes must be blanked, so that water can be run down the column before opening.

A large spillage of benzole would necessitate the taking of precautions at adjacent oil or tar stills. The occurrence of a fire may need high water pressure and as a precaution water should be shut off from stills and similar vessels. The danger of sparks cannot be emphasised too strongly in the case of a benzole distillation plant; in consequence it is necessary to warn fitters and keep them under observation to see that the danger of sparks does not arise. Sparks due to static electricity have also to be guarded against, and this will necessitate the use of earthing wires when rail or road tanks are being filled or emptied. Such a tank when stationary, for filling or discharging, can also be a source of danger if warning of its presence is not given upon the rail track or road by means of a red flag.

Such precautions as the foregoing could be formulated in detail for other parts of a by-product works, i.e., for the tar plant, for mixers engaged in washing crude benzole, for the general handling of hot tar, tar acids, hot press naphthalene, and for the pumping of tars and oils. Some precautions may be considered too obvious and yet it becomes necessary to make reference to them. For instance, it is necessary to be sure of the operation of cocks and pipe-lines before starting to pump tars and oils.

Before breaking a joint in a pipe-line it is necessary to make sure that no pumping is taking place, and that precautions have been taken to isolate that part of the pipe and thereby prevent troubles arising should a pump be started up in error. Arrangements must be made to catch any leakage which takes place when the joint is broken; indeed, in the case of a long length of pipe which may be full of liquid these arrangements must be adequate. When repairing pipe-lines or pumps precautions must also be taken to see that all pressure has been released before opening out. Jobs which involve dismantling for repairs must be left in a "safe state" if they cannot be finished, and due warning must be given to the process foreman and to workmen where the plant is being operated continuously.

New Anti-Corrosion Process

Electrolytic Deposition with Novel Features

It is known that the more porous a metal surface may be, the quicker it will corrode, for it is the interstices in the surface which hold the attacking fluids or gases to enable a favourable start, whereupon further porosity is formed and so proceeds the vicious circle. If incipient attack can be repelled, the strength of the defence is apparent. For example, metallic surfaces which have been polished or otherwise mechanically treated whereby the pores are to some degree closed, will be more resistant to corrosion than untreated surfaces of the same material.

In the Roval process, introduced by International Corrodeless, Ltd., a special bath and electrodes are used to deposit a mixture of metals on the base metal. By the use of so-called accelerators, which are thought actually to increase the speed of impinging particles, such deposition is found to penetrate the metal pores so that they are completely closed. The result, in general, is that a surface is presented which withstands to a remarkable degree the formation of oxides or other salts which result as a product of decomposition. As this process is dependable for its result on the closing of pores rather than a protective layer, it is not necessary or desirable to build up any appreciable metallic depth. This feature offers a great advantage over ordinary plating or spraying processes inasmuch as the dimensions of the article treated are virtually unaltered, so that no adjustments or machining are necessary even in the case of precision work. For instance, screw threads may be treated without impairing their fit.

Another important advantage is that simple preliminary cleaning or pickling is sufficient to ensure satisfactory results. In the case of plating or spraying processes it is frequently necessary to sand blast surfaces in preparation for subsequent coating in order to give a key; an operation to be avoided when possible. Further, because existing processes are dependent on intimate contact and adhesion of an appreciable coat to the base metal, it is obvious that surfaces must be entirely clean and neutral, otherwise corrosive action may proceed under the coating which will result in its being eventually caused to flake off with consequent renewed corrosion which always proceeds with acceleration.

New Plant Accessories

A Technical Advance by Simplification

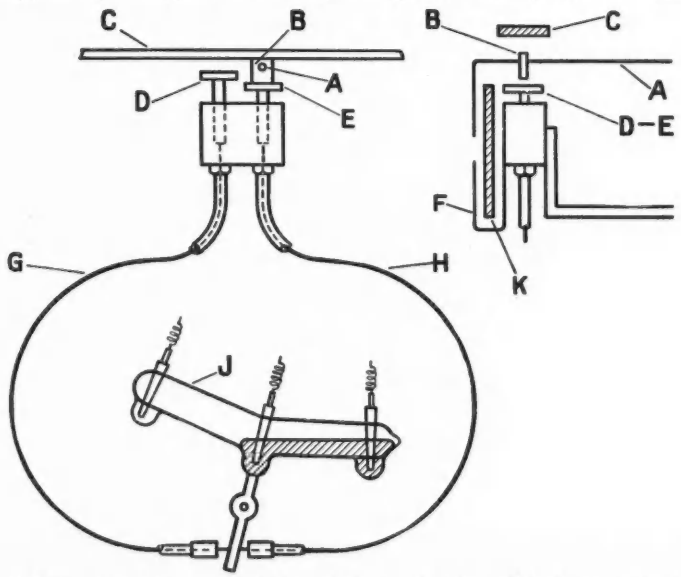
IN present times it is pleasing to find an advance in technical achievement which is accompanied by something simpler than previous apparatus for the same function. An example of such an improvement is the Foster patent Flexipush controlling pyrometer, introduced by the Foster Instrument Co., Ltd.

Pyrometer indicators are adapted, by the application of subsidiary apparatus, to advance from simple indication to full automatic control of the furnace or other apparatus whose temperature is measured. The system broadly involves some automatic action when the pointer of the indicator departs from the position on the scale at which it is desired to determine the temperature, when it falls below, the heat is put on or increased and conversely when it rises above the heat is cut off or decreased. Usually this operation is achieved by periodic depressions of the indicator pointer, for instance, to some form of contact making device and it is in this device with its accessories, that previous designs involved complicated arrangements all with possibilities of unexpected failure. Having made contacts, as mentioned above, the relays are operated to open or close control circuits, for instance, by tilting one or more sealed mercury switches with " drowned " contacts.

In the Flexipush design the operation is reduced to what is probably the ultimate simplicity. The mechanism is illustrated diagrammatically, where the pointer A overhangs the edgewise scale K, so as, at all times, to show the actual temperature. Upon the pointer is mounted a finger B and the pointer is periodically depressed by the presser bar C at other times being free to take up its true natural deflection according to the temperature. Situated below the normal level of the pointer is a bracket carrying a pair of platens D and E. This bracket is provided with a pointer F which is exactly opposite to the mid-position between these two platens and the whole bracket may be set by the user to point to the temperature at which the furnace is to be maintained.

If the furnace is at the desired temperature, on the next depression the finger B will bear upon the two platens D and E and no change will take place in the posture of the apparatus, but if, as illustrated, the pointer has passed even a small amount above the desired temperature, the finger B depresses the platen E. This platen is connected at one end of a flexible pusher mechanism and at the other end it is out-thrust to tilt the two-way mercury switch J into the position illustrated. In this position the circuit is closed, which will have the result of cutting off or reducing the heat. It is obvious that the converse takes place when the temperature falls below the desired figure.

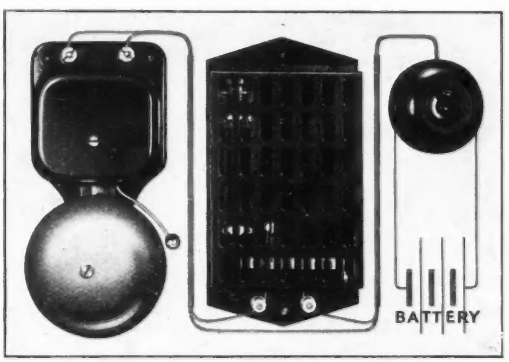
The advantage of this flexible pusher action is that the relatively heavy switch and its mounting need not be moved, but remains stationary in the instrument case, yet the bracket and the system of platens can be moved freely to any part of the scale. Users having experience of delicate electric contacts will appreciate the qualities of a simple and direct mechanical thrust. A small electric motor with reduction gear is incorporated to produce the periodic depressions in a smooth and convenient manner.



A diagrammatic representation of the mechanism of the Foster patent Flexipush controlling pyrometer.

An Alarm Bell for Humidity Conditions

THE changes of humidity in this country are frequent and sometimes the difference in percentage of humidity is considerable; within a period of 24 hours it may change from,



The Humatagraph humidity alarm bell made by the C.L. Burdick Mfg. Co.

say, 40 per cent. to 70 per cent. Changes indoors are, of course, not so violent; nevertheless changes may occur which will seriously interfere with printing, spinning, weaving and the processing of various substances.

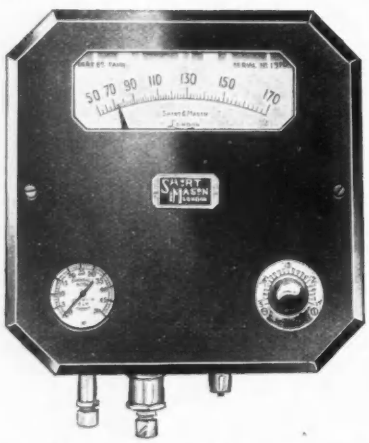
The new humidity alarm bell, introduced by the C. L. Burdick Mfg. Co., is designed to give notice of such changes. It is very sensitive to humidity changes and can be set to give the alarm if the percentage goes 1 per cent. higher than that for which it is set. Alternatively, it can be arranged to ring the bell when the percentage of humidity drops, and if the air became 1 per cent. drier than that at which the instrument was set it would ring. The installation could be arranged to ring two bells at the same time; for instance, one in the office and one in the works. It can also operate an electric torch lamp in place of the bell.

The humidistat is mounted on an ebonite base and is provided with a well ventilated metal cover. Two models are made; one is arranged to ring a bell when the humidity increases beyond a percentage at which it is set, and the other rings the bell when the air is becoming dry.

A New Indicating Controller

IN answer to the insistent demand for high quality air-operated controllers, where close control is essential, but where a record is not required, Short & Mason, Ltd., have perfected the Fulscope indicating controller. This instrument incorporates many of the characteristics found only in the Fulscope recording controller.

The "heart" of all Fulscope controllers is the Universal sensitivity adjuster. By sensitivity is meant the movement of the indicating pointer which will cause the control valve to change from a fully opened to a fully closed position. Close throttling control is only obtainable when the controller sensitivity is perfectly adjusted to the time lag of the process. If the controller sensitivity is too high for the process time lag, changes in the rate of the controlling medium input will be faster than the apparatus can absorb them, and an oscillating or "hunting" control results. Too low sensitivity produces a sluggish control, with unnecessarily large control point deviations when disturbances occur. In other words, the sensitivity should always be as high as possible consistent with the prevention of "hunting."



The Universal sensitivity adjuster of the Fulscope indicating controller.

The Universal sensitivity adjuster provides an infinite number of sensitivity values which are demanded by an infinite number of operating conditions encountered. The one best sensitivity for a given application is easily obtained merely by turning a graduated dial. By this adjustment it is possible so to alter the control mechanism that the pointer moves from 0.14 per cent. to 100 per cent. of the scale range to cause a full one way stroke of the diaphragm valve. The control mechanism is permanently adaptable to the most drastic changes in operating conditions, or to being transferred to radically different apparatus.

In the chemical and associated industries where reliable, close control is essential, this feature is of immense importance, particularly in view of the very difficult operation conditions experienced with chemical plant. The control point is easily changed by moving a knurled knob in relation to a graduated dial, which is calibrated to the range of the controller. The instrument can be changed from reverse to direct action on site (or vice versa), by merely altering the position of a link in relation to the pointer-arm pivot.

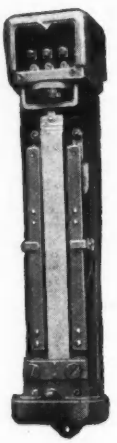
Humidistat with Many Novel Features

THE British Thermostat Co., Ltd., have recently redesigned the "Teddington" humidistat, introducing many new features which render the instrument suitable for a still wider range of applications.

The humidistat is an automatic switch, the opening and closing of which is governed by the moisture content of the surrounding air, irrespective of the prevailing temperature. It can, therefore, be employed to control such apparatus as electric heaters, fans, damper units, motorised valves and the like in humidifiers, driers and other air-conditioning equipment. Since the instrument is sensitive to changes in relative humidity only, irrespective of the wet and dry bulb temperature, it can be used directly for the control of humidifiers and driers used to maintain a constant relative humidity in such installations as tobacco and textile factories, paper and printing works, and other buildings where the correct degree of humidity is of prime importance.

These humidistats must not be confused with hygrostats, which are merely sensitive to differences between the wet and dry bulb temperatures, nor with other "dew point" controls which are intended to maintain a constant wet bulb temperature and require a constant dry bulb temperature in order to maintain a pre-determined relative humidity.

The sensitive element in the Teddington humidistat is a strip of specially prepared hygroscopic material which is held under tension. Expansion or contraction of the strip with change in relative humidity operates the switch arm. A system of relief springs prevents the sensitive element from being strained under conditions of excessive dryness. Three models are supplied, one with a single switch, arranged either to make or to break circuit on increase of humidity; one with two switch elements operating at the same or at different settings; and one with change-over contacts arranged to close one circuit on an increase of humidity and to close the second circuit on a decrease of humidity.



A new model humidistat introduced by the British Thermostat Co. Ltd.

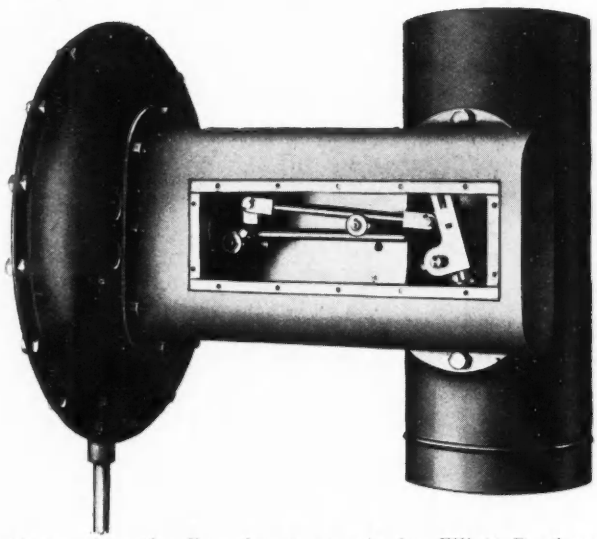
The standard range is 50 per cent. to 90 per cent. relative humidity, and the standard differential setting is 2 per cent. relative humidity. The switch has silver contacts with magnetic snap action, and will break 5 amperes at 250 volts A.C. or 0.2 amperes at 250 volts D.C. A mercury switch can be fitted for use in positions where it is essential that the contacts should be totally enclosed.

An Automatic Flue Damper

AN automatic damper intended for use with gas-fired boilers and furnaces, in conjunction with automatic temperature regulators which control the gas supply, has been introduced by Elliott Brothers (London), Ltd. The illustration on the next page shows the flue damper with the side cover removed so that the interior mechanism can be seen. On the right-hand side is a short section of chimney pipe of the same diameter as the furnace chimney. The damper rotates on an axle inside this pipe and the short crank fitted to one end of the axle can be seen. At the left-hand side is a circular chamber containing a leather diaphragm which is operated by means of the regulated gas pressure. The movement of this diaphragm, operating the connecting rod and crank, causes the damper to rotate.

When fitted to a furnace, the chimney pipe forms a section of the chimney flue and the gas pipe which connects the diaphragm chamber to the regulated gas supply is usually a small copper pipe of about ¼ in. bore. The great advantage of this device is that it forms a very simple and convenient method of linking the damper control with the gas control;

the only connection required being the one small pipe referred to above. Previous methods have necessitated the provision of a rather awkward mechanical connection between the motor-driven gas valve and the chimney damper, by



The automatic flue damper made by Elliott Brothers (London) Ltd.

means of wires, chains or rods, etc.; the relative position of the gas valve and chimney damper sometimes introducing considerable mechanical difficulties.

The main purpose of this pressure-operated automatic flue damper is to maintain a correct relationship between the gas and air supply and so—by maintaining a constant CO_2 percentage in the flue gases—to increase the overall efficiency of the furnace.

A Special Meter for Chemical Solutions

A SPECIAL Arkon meter for chemical solutions is now being supplied by Walker, Crosweller & Co., Ltd. It is the same in general appearance as their Arkon oil meter, but has specially designed internal parts employing special metals for the measurement of corrosives and caustic solutions of various types.

Arkon oil meters were designed for the accurate measurement of mineral and vegetable oils and all industrial liquids. They are guaranteed accurate within ± 1 per cent., and will work for 24 hours a day for years without attention, save for an occasional cleaning when measuring dirty oils. They will measure hot oil up to 200° F., and oil under pressure up to 150 lb. per square inch, being suitable for use with a head as little as 2 feet or even less in the small sizes. Each Arkon oil meter, moreover, is individually tested before leaving the works. Oil is run through into a tank of which the exact capacity is known. The meter is then calibrated to measure within + or − 1 per cent. of absolute accuracy within its rated capacity. For the measurement of petrol or other costly liquids when greater accuracy is required over a certain range, an accuracy regulator can be supplied with the meter enabling the accuracy to be adjusted within ± 0.5 per cent.

Walker, Crosweller and Co., have also recently introduced a new Arkon meter for paint and lacquer. Designed for fitting in paint or lacquer pipe lines, this meter registers with precision down to rates of flow far below commercial requirements, and up to 720 gallons per hour. It is recommended for use with air operated spray guns fed from pressure containers. Pressure loss is dependent upon viscosity of the liquid, but is in general about one ounce per sq. in. at 1 gal. per minute.

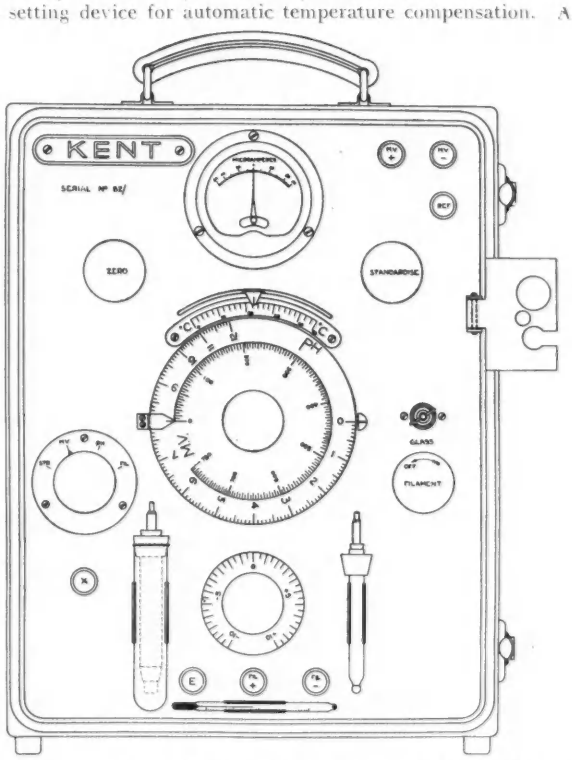
Portable *p*H Potentiometer

GEORGE KENT, LTD., have recently introduced the Kent portable *p*H potentiometer for taking spot readings of *p*H values. It is a compact unit which can be transported easily and used for testing in any location. It is absolutely self-contained in an aluminium case complete with a lid and leather carrying handle.

The metal case acts as an effective screen for the circuit which incorporates a two valve Wheatstone Bridge network, together with an accurate potentiometer. The accuracy is independent of the valve characteristics, and the potentiometer is standardised against a standard Weston cell. The current for the valves and filaments is supplied by a long life dry battery, and the rest of the circuit is worked at low voltages, thus reducing the batteries required to a minimum, and increasing the life of the valves.

All measurements are made with reference to the micro-ammeter shown at top centre. The electrodes are shown at the bottom clamped in the normal position for carrying. They consist of a high resistance glass electrode, having a platinum interval electrode dipping into a solution of deci-normal hydrochloric acid saturated with quinhydrone, and a saturated calomel electrode with a potassium chloride salt bridge. When making tests, these electrodes are removed and inserted, together with the thermometer, in the holder on the right hand side.

The central rotating dial is marked off from 0 to 12 *p*H and from 0-780 millivolts, and directly above this is the scale with a setting device for automatic temperature compensation. A



measurement is made by rotating the central disc until there is no deflection of the micro-ammeter, and then reading off the *p*H value on the engraved scale.

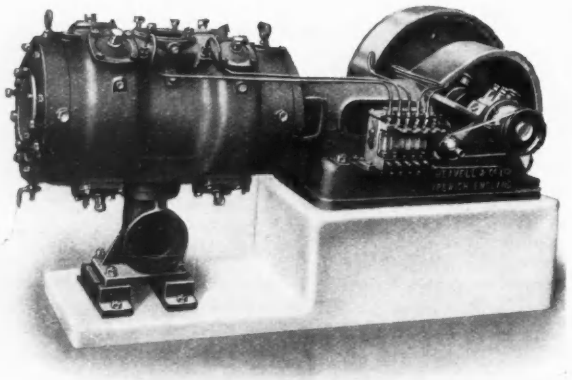
On the left hand side of the *p*H potentiometer is a multiple switch. When this is turned to the standardising position, the potentiometer circuit can be standardised by means of the appropriate rheostat.

The accuracy of measurement is plus or minus 0.05 *p*H, or plus or minus 2 millivolts.

George Kent, Ltd., have also modified their ring balance recorder recently. A panel mounted model is now supplied. Further, the use of the Kent Multelec recorder has been extended to gas analysis, and it is used as a standard CO_2 recorder.

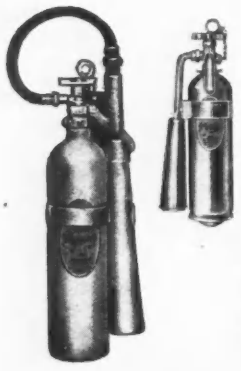
Straight Line Vacuum Pumps

REAVELL AND CO., LTD., have recently produced a series of vacuum pumps for high efficiency duty for high vacua. Although these machines are intended to be used as dry vacuum pumps the suction valves are placed near the top of the cylinder, and the delivery valves near the bottom, so that if a small quantity of moisture comes in through the suction pipe, the cylinders will be self-draining. As the cylinder diameter is not large with relation to the stroke no tail rod for the piston is required, and therefore there is only one stuffing box through which leakage may occur to reduce the efficiency of the machine, and the gland of this stuffing box is readily accessible for repacking. The cylinder and cover are water-jacketed with a view to keeping down the



One of the new straight-line vacuum pumps introduced by Reavell and Co. Ltd.

temperature of the rarefied air under compression before delivery to the atmosphere, thereby helping to maintain the high efficiency. The valves used are of the ported plate type, and are of stainless steel, having a large area, and a very small lift. The springs provided for these valves are of ample diameter, and are designed so as to give the lightest possible spring load for the suction valves. The larger machines are provided with a multiple feed lubricator driven by belt from the crankshaft, so as to provide a measured feed of oil to all the working parts. In the smaller sizes the lubrication of the working parts is by drip feed. These machines may be driven by a flat belt or by "V" belts, and when driven by electric motor the use of "V" belts is recommended in order that the motor can be placed quite close to the crankshaft end of the machine. The piston displacement available covers a range from 162 cu. ft. per minute to 2,000 cu. ft. per minute.



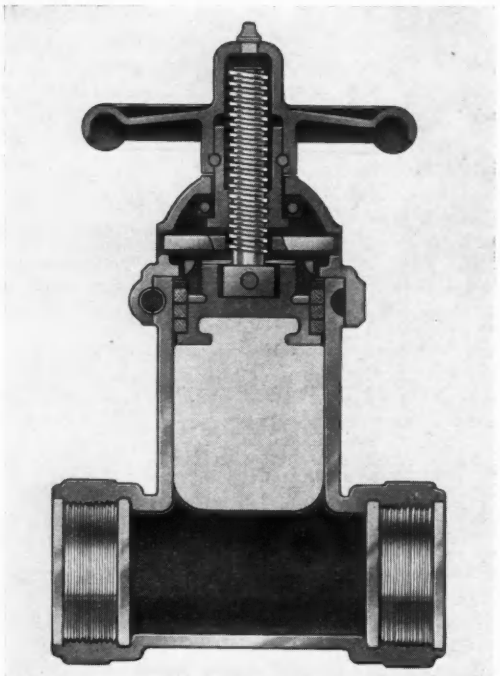
Two recent additions to the range of CO_2 fire extinguishers made by The Pyrene Co., Ltd. They are of 4 lbs. and 2 lbs. capacity respectively and are particularly light and easy to handle. They have the advantage that the contents can be conserved during operation.

A New "Straightway" Valve

THE Saunders "Straightway" valve introduced by the Saunders Valve Co., Ltd., has been designed to give a full-bore "pocket-less" straight through passage, thus supplementing the Saunders diaphragm valve for very high velocities, high viscosities, solids in suspension, sludges, pulps and similar semi-fluids requiring "rodding through," and foodstuffs and other perishables where "brushing through" is desirable. Generally speaking, the "Straightway" valve will also be suitable for all the purposes for which the diaphragm valve is listed, but will stand somewhat higher temperatures and chemical concentrations.

General Construction

As will be seen from the accompanying illustration, the valve belongs generically to the "Gate" family, but the body is without pockets or seats, and the gate takes the form of a cylindrical semi-hard rubber plug, fitting loosely into an appropriately dimensioned chamber. When full open the valve offers a full-bore uniform passage to the fluid. The closing operation is performed in two stages: Firstly, the



The new "Straightway" valve made by the Saunders Valve Co., Ltd.

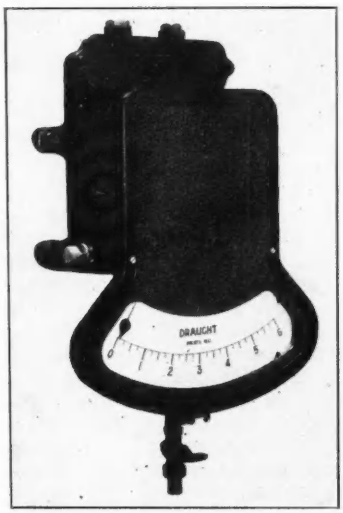
bottom of the plug contacts with the flat underwall of the body, and secondly, continued tightening of the screw shortens the plug endways, and since rubber is volumetrically incompressible, the resultant radial expansion causes the plug to seal the passage in all directions. Thus all grinding and rubbing actions are eliminated between valve and seat, and no accurate metal surfaces are required.

Use of Gland Not Disadvantageous

Unlike the Saunders diaphragm valve, the "Straightway" valve requires a gland, but, in this case, the disadvantage is not overwhelming, because the new valve is designed mainly for viscous fluids. Moreover, the gland has been devised so that it is automatically tightened by the extreme movement of the handwheel at both ends of the stroke, and it is therefore only in the intermediate settings that the packing requires adjustment. This can be obtained when the valve is full open, by means of the castellated packing nut, which, in this position, is relieved of all load.

Transmitting Low Pressure Readings Electrically

THE Elliott low-pressure transmitter (Shotter patents), a production of Elliott Brothers (London), Ltd., will transmit electrically, over two pilot wires to a considerable distance, readings of low pressure or draught. This equipment consists of a multiple diaphragm type pressure gauge combined with an Elliott transmitter. The lowest range available is 0-1 in. W.G. pressure or vacuum and the highest 0-150 in. W.G. Instruments may be scaled with centre or set-up zero, reading pressure on one side and vacuum on the other.



The Elliott low-pressure transmitter.

The gauge is provided with a special " shut-off " cock which vents the gauge to atmosphere in the shut position and permits easy checking of the zero. An external zero adjuster is provided. The equipment is particularly suitable for transmitting the pressure at remote points of large gas distribution systems to a central office, and, since the equipment is devoid of contacts, risks due to sparking are absent. It also permits the transmission of pressures at various parts of large gas-making plants to a central control room. An A.C. supply is required for operation of the transmitter.

Safety Appliances for All Needs

During the past year the industrial safety equipment department of Wallach Bros., Ltd., introduced a number of new features. A new material known as " Evertrustyte " to withstand oil and grease is now made up into bib aprons, smocks, bib and brace overalls, overall leggings with spats, and gloves. The new " Evertrusty " Cellone eye shield on swivel fibre head bands is supplied for workers who are unable to wear goggles. A sheepskin leather welders' jacket, specially designed for those engaged in extensive welding, has also been introduced, together with a largely increased range of gloves and mitts for all industrial processes. Improvements in the " Evertrusty Degea " C.O filter canister (which protects against all gases including carbon monoxide) provide that this filter will now last in storage for four years, whereas formerly it could only be stored for two years when not in actual use.

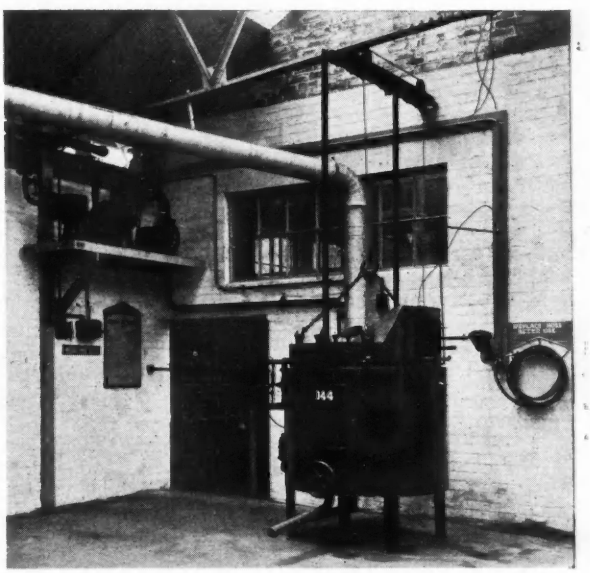
Minimax, Ltd., are shortly to introduce a new series of CO_2 fire extinguishers. Details of the new equipment are not yet available, but it is said that their most outstanding feature is the incorporation of a new type of controlling valve of revolutionary design. They will be supplied in a full range of sizes.

Exhaust Fans of Improved Design

THE range of Genalex exhaust fans sold by the General Electric Co., Ltd., now embody many recent improvements, principally in the direction of high efficiency, quiet operation, reliability and appearance. The exceptionally high performance of the fan blade enables the required air displacement to be obtained with a relatively low peripheral speed, thus minimising power consumption and lowering the first cost. Furthermore, the single phase fans are now fitted with high efficiency switchless capacitor motors, thus greatly reducing the cost of running. Up to 18-in. diameter the continuously rated condenser is built into the end of the motor (opposite the fan end), neatness of appearance is thus achieved whilst wiring and erection are simplified.

An important advance towards quietness of operation has been made by the introduction of resilient mounting. The use of a four-arm motor support provides a more rigid assembly, and the new four-lug ring facilitates erection. Unusual accessibility for wiring is obtained by the use of a new type of terminal block, cable gland and earth clip; all motors are provided with lubricators which are easily accessible.

Standard Genalex ring-mounted exhaust fans are made in a wide range of diameters (from 9 to 48 in.) and speeds, from three to eight speeds being available in the different sizes. Special types are available for diaphragm mounting, in flameproof designs, and for operating in hot gases or refrigerator chambers.



Lead melting equipment recently installed for Messrs. Mellowes in Sheffield by W. C. Holmes and Co., Ltd. This embodies an entirely new departure as the heating is effected by an element immersed in the metal, the air and gas being mixed in correct proportions by means of a novel carburettor so as to ensure complete and highly efficient combustion. The capacity of the plant illustrated is 2½ tons of lead per hour.

NASCENT aluminium chloride is an agent of wide potentiality for the conversion of paraffin wax into a series of other hydrocarbons, according to an investigation by Otin and Dima (described in *Chimie et Industrie,* of August, 1938). The reactions taking place include fission, reduction (by the nascent hydrogen simultaneously formed), polymerisation, isomerisation and cyclisation. Fission results in formation of volatile liquids and polymerisable heavy products, the former being fully saturated, while the latter are unsaturated oils. Cyclisation with formation of aromatic hydrocarbons, including a considerable proportion of benzene and toluene, has never been observed when using anhydrous $Al_2 Cl_6$.

Accident Prevention at the Works of I.C.I. (Fertiliser and Synthetic Products), Ltd., Billingham

By
R. J. WOODS, Works' Safety Officer

THE management's accident prevention policy at the Billingham group of factories of Imperial Chemical Industries, Ltd., is based upon the attempt to reduce to a minimum all physical risks inherent in manufacture, and upon the accepted fact that the majority of accidents are the result of what is usually termed "failure of the human element." This neither implies carelessness generally, nor does it refer particularly to any section of the personnel.

It may be said that every physical effort or achievement involves some possibility of accident. The complementary element of safety is usually relatively complex and perhaps obscure. In the conception stage, the primary responsibility for assessing risks and introducing counter measures rests with the research and design departments. Thereafter, providing all the inherent risks have been taken into account, the responsibility for accident prevention is transferred to the construction, process and service departments. Obviously, such a comprehensive assignment of responsibility can have no effective results unless accident prevention is made part of everyone's job. It is equally apparent that, apart from adhering to the management's co-ordinating principles, the various sections of the factory must be given freedom of action in working out a safety scheme to suit their particular operations. The workman's share should consist mainly in the observance of regulations, making use of the safety appliances provided, and exercising care in the simple operations which must inevitably remain his personal responsibility, e.g., the handling of materials, movement about the factory, and the manipulation of tools.

Description of Works

The Billingham works consist of a group of factories, each concerned with the manufacture of a distinct series of products. These may be described broadly as fertilisers, petrol, plastics, cement and general chemicals. The scale of the operations may be gauged from the extent of the site which covers 1,000 acres. The number of workmen is about 9,000. The service units include a power station; large workshops comprising machine, platers, plumbers, sheet iron, blacksmith and electrical shops, and woodworking shops; extensive stores; distribution, rail and road transport and research laboratories. There are two wharves for the delivery and shipment of materials.

A high standard of tidiness and cleanliness throughout the works is an important factor in safety. In addition to eliminating many hazards it has a beneficial effect in inducing careful habits and better methods of working. In many parts of the works, spaces which are likely to remain uncovered by buildings or plant have been laid out with grass and are kept with the appearance of a lawn.

Standards of Safety

The basis of the physical safety measures is three-fold:—(a) The provisions of the Factory Act and the various Home Office Regulations which apply to the factory; (b) engineering safety standards; (c) operation and procedure regulations.

The safety standards were drawn up by a committee of engineers representing the various I.C.I. works in Great Britain and were designed to cover the risks presented by plant and machinery, electrical apparatus and civil and structural engineering work. The standards take the form of recommendations and are not rigid requirements. In some circumstances it may be necessary to depart from the precise definition of a standard in order to secure the desired degree of safety. The works regulations include measures to ensure safety in process operations and in other activities where it is anticipated that the actions of individuals may lead to accidents unless they are confined to a definite procedure.

Buildings, Roads and Railways

The buildings and plants have been laid out to facilitate access, to localise mishaps in those in which the more dangerous materials are processed, and to avoid cramping, by the reservation of space for extensions. Provision is made for easy exit from all buildings; barriers are fitted outside the doors, where they open on to a road or to the vicinity of a railway line. Two main thoroughfares run east and west. These are double roads and between them is a wide space on which the main pipe bridges are situated. Secondary roads run north and south across the main avenues. The site is covered by a network of railways connecting the buildings with two marshalling grids.

Where practicable, the traffic on main roads is subject to a "one-way" system. The roads are kept as clear as possible of standing vehicles by the provision of cycle sheds, large garages and parking places, clear of the thoroughfare. All locomotives are fitted with an automatically operated warning bell and, before a loco or train crosses a road, the attendant shunter precedes it and stops the traffic, vehicular and pedestrian. The movement of rail traffic is governed by regulations which are designed to secure safety both to the rail operatives and to others in the factory.

Plant and Machinery

Reference has already been made to the high standard of cleanliness and tidiness maintained throughout the works. In some plants the nature of the processes makes it difficult to prevent spillage. This is cleared away as soon as possible and efforts are continually being made to devise remedies for these inherent defects; in this respect considerable progress has been made. Where excessive heat or an accumulation of unpleasant vapour has been experienced the ventilation has been improved, either by a mechanical installation or by structural alterations to the building.

Systems of inspection and constant maintenance have resulted in very few accidents arising from the failure of parts of plant, tools or other gear. Where there have been accidents of this nature the mishaps have generally been caused by men using unauthorised gear or not observing the regulations governing its use, inspection or repair. If the investigation into an accident shows that some risk is not adequately covered by the existing procedure or regulations, steps are immediately taken to introduce the necessary preventive measures.

Where any danger might arise through a person entering a vessel or similar place which had contained a dangerous substance, such entry is permitted only after a responsible member of the staff has certified in writing that the vessel may be entered; the necessary safety measures to be taken are defined on the certificate. Similarly, all machinery and plant is handed over to the maintenance section by means of a "clearance" certificate before any work involving danger is permitted to be done. The process or operation section loses control of that portion of the plant until the "clearance" has been closed by a responsible member of the maintenance staff.

Before a maintenance workman is permitted to approach any mechanically operated machinery or plant the electrical fuses must be withdrawn and the operating switches locked

by a key which the workman retains until his work is finished. Unauthorised persons are not permitted to enter any process building or approach any plant.

Protective Clothing and Appliances

Suitable protective clothing and footwear is provided for those who work on processes involving the use of corrosives, hot substances or refrigerants, and where workmen may have to deal with quantities of oil or other materials likely to cause excessive soiling of the clothes.

The protective appliances supplied include goggles of many types, respirators to suit the various gases or fumes in the processes, various sorts of gloves, face shields, dust masks, etc. The workmen are encouraged to wear either strong boots or safety boots. Safety boots are being adopted by the men in increasing numbers, even where they are employed on work not usually presenting foot risks.

Improvements in the design of protective appliances are continually under review, but it is considered that, where possible, alterations in plant design, or the fitting of a suitable device to eliminate the necessity for wearing a protective appliance is to be preferred. A central anti-gas station is responsible for the maintenance of all anti-gas gear and the training of workmen in anti-gas work. Each plant carries the necessary anti-gas equipment for its processes and the workmen are trained in its use.

Fire Prevention

All fire hazards are covered by the provision of suitable fire-fighting equipment. The plant lay-out is designed to localise the effect of a fire and process operation permits the cutting off of supplies of inflammable material from the site of a fire. Fire squads are trained. These men carry out their normal process duties until the fire alarm is given. They then proceed to the scene of the fire and act in accordance with a procedure which has been frequently rehearsed. For major fires the services of the district fire brigade are employed. The fire station is situated just outside the factory area.

Accident Prevention Campaign

An intensive safety campaign was started in 1928. During the past ten years many experiments have been made in the constitution and type of safety committees and in forms of propaganda. The main points of the campaign are as follows:—

(a) *Safety Organisation.*—The direction of the accident prevention campaign is in the hands of the managing director, who is assisted by a safety officer with a small staff. The safety officer's duties may be summarised as attending to the details incidental to the campaign; assisting the plant managements in implementing the director's safety policy; carrying out independent inspections and investigations; and keeping in touch with accident prevention progress generally.

(b) *Safety Committees.*—Each plant has a safety committee with the manager as chairman and representatives of staff and workmen as members. Meetings are held quarterly to discuss the accident position on the plant concerned. A few months ago a general safety sub-committee system was inaugurated. A sub-committee consists of the plant foreman as chairman with workmen's representatives as members. These sub-committees hold frequent, short meetings at the discretion of the foreman who is at liberty to conduct his sub-committee as he thinks fit. The sub-committees discuss the safety of the plant and machinery with which the members are immediately concerned; recommendations for improvements in safety are submitted to the plant manager for consideration.

(c) *Propaganda.*—The usual type of printed safety posters are exhibited on notice boards at the entrance gates and at various places on the site. Preference is given, however, to photographic posters illustrating typical hazards on the site, the reconstruction of accidents and other safety matter. Occasionally a photograph is exhibited depicting a number of unsafe conditions which had been arranged on one of the plants. A list of the hazards is published a week later. Among other material exhibited are the results of investigations into lost time accidents. The names of the workmen concerned are not shown. Each plant has a board on which safety notices concerning the particular plant are exhibited.

(d) *Safety Suggestions.*—Workmen are invited to submit safety suggestions. Monetary awards, varying from 5s. to £1, are made in respect of accepted suggestions. Last year 1,400 suggestions were received; 44 per cent. of this number received awards totalling £205.

(e) *Information and Training.*—In addition to the safety information derived from attendance at meetings of safety committees and sub-committees and from general propaganda, selected staff and workmen are given the opportunity to attend safety conferences organised by the National "Safety-First" Association. Other safety activities include reports on the accident position at the monthly meetings of works' councils, and meetings of staff and foremen, held by the managing director for general discussions on accident prevention.

Process workmen are carefully trained in their duties; safe operation being treated as a very important item. When youths are engaged for general work their duties are explained by a foreman or charge-hand and they are given talks on safety and the hazards on their particular work are explained during visits to the plant. A charge-hand and an experienced youth are made responsible for keeping an eye on new comers to the plant. Apprentices are given a series of lectures on a variety of subjects to give them an understanding of the plants, processes and administration. Accident prevention is included.

A comprehensive welfare scheme is conducted by the labour manager. Details of the scheme are outside the scope of this article, but it cannot be emphasised too strongly that welfare contributes in no small degree to safety by inducing contentment and offering facilities for comfort and recreation.

Medical Service

A resident medical officer is in charge of the factory medical organisation. The staff consists of an assistant medical officer with a number of experienced ambulance room attendants. The majority of the latter are ex-members of the medical corps of one of the Services. There is a well-equipped surgery at the centre of the works and a number of ambulance rooms at the more distant places. A motor ambulance is stationed at the surgery. Large numbers of workmen are trained in first-aid. Those who attend the prescribed course and pass the examination receive an annual bonus.

The medical organisation plays an important part in accident prevention by looking after the general health of the staff and workmen and also the conditions of working. The immediate and skilled attention to cases of injury reduces the "severity" of accidents.

An indication of the success of the management's safety policy may be obtained by comparing the accident frequency rate at the present time with the rate when the campaign was started. In 1928 the accident frequency rate for the factory was 9 accidents per 100,000 hours worked; at the present time the rate for the same group of plants and services is 0.87. The primary cause of the majority of accidents has remained the same; failure of the human element. An accident prevention campaign cannot have any effective result without the active and continued interest of the management, and co-operation on the part of staff and workmen.

EXTENSIVE graphite deposits with a high platinum content are reported to have been discovered in the valley of Western Morava, Yugoslavia. Up till now graphite has been imported into the country.

Death of Mr. W. R. Barclay

An Eminent Metallurgist—Forty-five Years' Work on Non-Ferrous Metals

MR. WILLIAM R. BARCLAY, one of the leading metallurgists in this country, died at his home in Birmingham on September 16, at the age of 63. He was undoubtedly one of the outstanding authorities on non-ferrous metallurgy.

Educated privately, Mr. Barclay, at the age of 18, attended the Sheffield Technical College (now the University of Sheffield), where later he became a part-time lecturer. He was an honours silver medallist in electro-metallurgy at the City and Guilds of London Institute and became an associate member of the Institute of Electrical Engineers in 1900. From 1893 to 1912 he successively acted as assistant to the works manager of Mappin Bros., Sheffield, and the works manager and technical advisor to Joseph Rodgers and Sons. From 1910 to 1919 he was lecturer in electro-metallurgy at Sheffield University, and from 1912 to 1928 he was joint examiner in this subject to the City and Guilds of London.

In 1914 Mr. Barclay was appointed a member of the Sheffield University Advisory Committee, and during the war he became chief metallurgist and assistant director in the

Mr. W. R. Barclay, O.B.E., F.Inst.Met.

Non-Ferrous Rolled Metal Section and technical director of the Electro-Metallurgical Committee of the Ministry of Munitions. During this period he revived the idea of utilising electric furnaces for the melting of cupro-nickel alloys, and an arrangement was made with Henry Wiggin and Co., Ltd., of Birmingham, for collaboration in the rolling of electrically melted metal.

In 1928, Mr. Barclay became managing director of the Henry Wiggin concern, and in 1931 he was appointed consulting metallurgist to the Mond Nickel Co., Ltd. During his association with the Mond Nickel Co., Ltd., Mr. Barclay was largely instrumental in initiating the company's now well-known research and development organisation, as a result of which, in conjunction later with the International Nickel Co., innumerable new uses were discovered for nickel and nickel alloys. He was associated with the Copper Development Association from its inception—indeed, the Empire copper interests both on the producing and fabricating sides are indebted to him for much original exploratory work in this connection.

In 1936 Mr. Barclay was elected president of the Institute of Metals and was re-elected to serve a further term in 1937. It was during his presidency that the Institute decided to award an annual medal for outstanding services to non-

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ferrous metallurgy. The first award was made this year to Sir William Bragg, F.R.S.

Mr. Barclay was well known in metallurgical circles in the United States, and he was invited to deliver the Calvin W. Rice lecture to the American Society of Mechanical Engineers in June of this year. At the same time, he was to be awarded the degree of doctor of science by the Stevens Institute of Technology. Unfortunately, owing to his illness, he was unable to attend these functions.

Mr. Barclay, who was the author of *Twenty-Five Years' Progress in Metallurgical Plant,* leaves a widow and two sons and two daughters.

Chemicals in South Africa

A New Food Product from Grapes

AFTER several years of research, a new South African food product, made from grapes, has been prepared by a firm of Western Province wine-growers. The process involved in the preparation of this new product eliminates wastage and turns to profit grape waste formerly thrown to the pigs by farmers and generally regarded as useless for any other purpose. Arrangements for marketing the new grape product, which is prepared in several forms as jelly slab and crystallised grapes, are in hand. The process extracts valuable food products not only from the juice and fruit, but also from the skin and seeds of the grape. It is plain to be seen that there is little cost in the manufacture of the new product. Medical opinion is that grapes are of highly concentrated food value, containing vitamins and amino acids of high dietetic value.

National Federation of Salt Producers

Steps are to be taken to form a national federation of salt producers. This decision has been taken by the Chamber of Salt Producers, which is representative of various pans, mainly in the Kimberley district. It was suggested that the national federation would request the Government to empower the federation to regulate and stabilise the salt industry. The federation would also endeavour to increase the consumption of salt and make investigations into the possibilities of improving the quality and preparation of salt to enable it to compete with the imported article. A committee, with Mr. A. de Villiers, of Jacobsdal, as chairman, has been formed to circularise all salt producers in the Union, asking them to form local associations and send representatives to a meeting of the national federation in Kimberley at a later date.

Cryolite for Dusting Wattle Trees

The success of the experimental dusting with cryolite of wattle trees in Natal by aeroplane to destroy bag-worms was described to the members of the South African Association for the Advancement of Science by the Department of Agriculture experimentalists who have been carrying out the work. Extensive collections of bag-worms have been taken throughout the treated areas a few days after the dusting and then counted, dead and living, in the laboratory. Visits to the plantations ten to twelve weeks after dusting showed the degree of defoliation in treated trees compared with the untreated trees. The scientists stated that the mortality on the fourth day after dusting ranged from 61 to 76 per cent., and on the twelfth day from 92 to 97 per cent. The lowest application of 16 lb. of cryolite had been sufficient to kill practically all the worms, under the excellent conditions for feeding that follows the dusting. More than 100 wattle growers have visited the plantation where the experimental work was carried out, and their views have been indicated by the fact that a combine has been formed for the aeroplane dusting of between 5,000 and 10,000 acres in October.

The Trend of Progress—Where are We Heading?*

The Trend of Progress in Food Science

By
L. H. LAMPITT, D.Sc., M.I.Chem.E., F.I.C.

THE aim of all food science is to ensure better food for the human being. This is the ideal objective—the academic worker struggling to elucidate the structure of a vitamin, the Government scientist working on increased crop production, the chemist in a laboratory of a food firm endeavouring to reduce costs of production or processing, all are working for the ultimate benefit of the consumer.

In respect of the more fundamental scientific aspects, the closer co-operation of physiologist and chemist has affected the trend of food chemistry in the last decade more than in any previous equal period of time, the importance of this aspect needs no stressing—such publications as the report of the League of Nations technical commission in 1936, and the report on Nutrition of the British Association for Labour Legislation, throw it vividly into relief. One phrase in the second mentioned I consider of striking importance, " . . . we must strongly oppose educational efforts that might lead to an increase in the consumption of protective foods at the expense of energy foods, owing to lack of sufficient money to purchase a diet adequate in all respects." Vitamins are put in their proper perspective in this sentence, and we here see a most important trend—in fact, we are heading towards a more sane appreciation of dietetics, perhaps not of dietetics as a science, but as an art, the knowledge of the feeding of the human race.

Dr. L. H. Lampitt.

I would like to mention certain factors influencing the general trend. First, the most important factor, namely, the desire of nations to be self-supporting, particularly in respect of the feeding of their respective nationals.

Any development of an agricultural policy can only be brought to a satisfactory conclusion by and with the help of those concerned with the science of food. We can take examples from the developments in our own country.

From 1935 onwards in Germany and Russia particularly, but also in the U.S.A., the synthetic production of fatty acids from hydrocarbons by oxidation has received much attention. These bodies can only be used—as far as I have heard—for high quality soap manufacture, but in countries aiming at a policy of national self-sufficiency, every ton of artificially-produced fatty acid which can be employed releases a corresponding quantity of fat for human consumption. This same tendency has resulted in Germany in the development of processes for the recovery of waste fat. And so we see the effect on the trend of food science of the economic situation.

We have heard within the last few days from Nuremburg of the vast stores of food materials in Germany. Are we to believe that Germany is alone in its accumulations of such products? Here, again, the desire for national self-sufficiency originally stimulated by economic forces, is now emphasised by national fear, and whole groups of chemists, the world over, are working with greater zeal than ever, with greater issues at stake than the commercial ones, on preservation.

" Preventative medicine " has become the ideal of the medical profession—and the term " preventative science " might be applied to the tendency there is to-day to reduce bacterial spoilage. This is essentially, in its present phase, a new trend, and the question arises, are we heading towards the storage of foodstuffs for almost endless periods of time.

Consider the meat problem. The most noteworthy development in recent years has been the introduction of chilled meat to the British market from Australia and New Zealand. This trade was unknown 6 years ago, and now Australia supplies approximately 5 per cent., and New Zealand approximately 4 per cent. of the chilled meat consumed in this country. This trade has been developed from the discovery that, by storing beef in an atmosphere containing 10 to 20 per cent. CO_2 at chilling temperatures the storage life can be increased by approximately 3 weeks, provided care is taken to reduce to a minimum the initial bacterial contamination of the carcase during dressing.

Conservation and preservation are words which are fraught with great power and influence in shaping the course of food science to-day. Karlsruhe and Cambridge, by their publications, have demonstrated the many gaps, important and fundamental, in our knowledge of the chemistry of new materials. And here let me say one word anent the parrot cry we so often hear to-day: " Science is International." It is nothing of the kind—science in such matters as we are discussing is very national. What shall be published in many countries of the world is not decided by the worker, but by the Government, because science has become *the* important factor in national economy and national security. One more example of this same trend—we are heading towards the total and complete control of scientific endeavour by governments. Whilst the nations of the world tend to this ideal, so will the de-internationalisation of science continue—a tendency which all true scientists must deplore.

The world is moving towards mass production; mass production implies standardisation. Now mass production in the food world, entailing standardisation, means a knowledge of the variations in natural products and, moreover, a knowledge of methods whereby such variations can be controlled or balanced. The manufacture of ice cream is an example of a production which is easy to control, because it merely entails a balance between milk solids not-fat, butter-fat and sugar, plus the stabiliser and the flavour—but the standardisation of bread is in a category entirely different. The composition as determined by our crude chemical methods yields practically no idea of the behaviour of any flour when made into dough, fermented, and subsequently baked. The complicated physico-chemical system, more complicated by the active enzymic principles present, does not yield to chemical assay.

There is a further trend of some importance which I feel I must mention. There are few countries now which have not their complete set of food laws, food laws in some countries more honoured in the breach than in the observance. It is, in many cases, the interpretation of the law or the interpretation of the results obtained by the analyst, rather than *facts* which will result in a verdict of guilty or not guilty,

* From papers presented at a symposium held on September 17 and 19 during the Autumn Meeting of the Society of Chemical Industry at Glasgow.

and, therefore, it is better practically for the interpretation of the law to be based on a chemical examination carried out in a prescribed manner (a most important point), rather than on word-depicted formulæ or recipes. The logical outcome of food laws are food standards, and food standards, in my opinion, can only be effective if based on scientific facts; the final decision should, therefore, be made on the result of chemical analysis. As a result of this tendency, great progress has been made in developing more accurate, and/or more standardised methods of analysis.

To summarise, we are heading towards:—

(a) International agreement with regard to certain aspects of dietetics, although internationalisation in the scientific world is less pronounced to-day than ever before.

(b) National and Government control of the efforts of chemists in the field of food science.

(c) Increased knowledge of food production imposed by national economics.

(d) Increased standardisation imposed by national and commercial considerations.

(e) Standardisation at lower quality induced by Food Laws.

(f) A better understanding of the true science of food production and preparation induced by Government action, and as a result of a better team spirit between the various sciences.

The Trend of Progress in the Building Industry

By

R. FITZMAURICE, B.Sc., A.M.I.C.E.

GREAT changes are taking place in the building industry, not in a revolutionary fashion, but gradually, yet nevertheless the total is quite considerable. The changes which are taking place have been forced on the industry by pressure of public demand, and the reasons for this are immediately apparent. The foremost reason is the change in habits of the community. People are demanding a higher standard of amenity than had ever been imagined over previous centuries.

A lot has been said of new materials, but actually there have not been very many major developments. The most important innovation was the introduction of the steel frame, followed within a decade or two by the reinforced concrete frame, to carry the major loads in buildings. Wide as has been the development of the framed structure it has been hindered to some extent by building regulations drawn up originally to deal with the traditional masonry structures. These regulations have also contained stringent requirements for protection against fire which have added considerably to the dead loads, and have consequently militated against as full economical development of the framed structure as its advocates desire. A start is now being made to introduce new methods into this aspect of building, and one may forecast that success in this direction will bring very sweeping changes in its train and scope for light forms of protection. It must not be forgotten, however, that the heavy concrete encasement is probably a very valuable protection against corrosion of the steel frames, and that in relaxing encasement requirements from the point of view of fire protection, it will be necessary to deal adequately with the problem of corrosion.

Cast stone has gradually won its way into the field formerly held by natural stone masonry. So far it has imitated the forms and colours of the natural stones, but there should be great scope for the development of a cast stone technique with æsthetic values peculiarly its own. The concrete roofing tile has made great inroads into the field in which formerly the clay tile held undisputed possession. The concrete brick or block is beginning to compete with the clay brick. An almost revolutionary change has taken place in joinery in the last few years. Plywoods and veneered boards, allied with chromium plate and stainless steel, are used extensively in place of ordinary timber, and a completely new technique has been evolved.

There are now very many British Standard Specifications for building materials, and a great deal of hard work has been done by various committees in drawing up the specifications covering quality, as well as dimensions. Many of these are most useful and should provide a valuable safeguard for the purchaser in respect of particular properties of materials which constitute a source of difficulty in practice. Thus the drying shrinkage of pre-cast concrete partition blocks is covered in B.S.S. No. 492. It is a little distressing to find, however, that the building industry makes singularly little use of the British Standard Specifications, with the exception of those for portland cement and drain pipes. It would seem that a great number of architects are not even aware of their existence. It is reasonable to suppose that the use of the B.S.S. for building materials will gradually extend as manufacturers take up the practice of marketing their products with some guarantee of compliance with the specification, basing this on routine testing. The position is changing to some extent, though slowly, for the British Standard Specifications are used to a greater or less extent in official specifications for government or local authorities' works, and their use may thus gradually extend to general practice.

Discussion

Corrosion of Steel Frames — Efficacy of Synthetic Products — Effect of Standardisation on Food Quality

OPENING the discussion on the above papers, DR. WILLIAM CULLEN said that he much admired the very clear manner in which the papers had been presented. He was specially interested in Mr. Fitzmaurice's statement that "heavy concrete encasement is probably a very valuable protection against corrosion of the steel frames." He had often considered the state of the steel which largely supported heavy buildings, such as the skyscrapers in America, and wondered whether they would last out the time for which they were originally designed. At the time when many of the American skyscrapers were constructed, mild steel, specially liable to corrosion, was used, as the special steels we now possess were not then available. Another problem which he had noticed was the choice of suitable stone used for memorial purposes. The stone was supposed to last for all time, but in many cases it suffered from excessive scaling off in the normal weather conditions of alternate freezing and thawing. When this occurred it was a sign of bad science and experience, but it was, at the same time, astonishing to notice how very well the building stones of old castles, still standing in many parts of the country, had lasted.

MR. H. V. POTTER said that Dr. Lampitt had stated in his paper that the tendency of modern food science was to provide us with better food. He would like to ask Dr. Lampitt to explain what he meant by better food. For, Mr. Potter continued, he himself was doubtful whether present-day science was not leading us into a state where the food was so pure that it was actually harmful to the system of the human body. Similarly, he wondered whether synthetically-produced things were quite as satisfactory, physiologically, as the corresponding natural products. He thought that the tendency towards synthetic production might perhaps lead

us into the wrong channels, and he would not be surprised to see, at some future time, a drift back to natural products.

MR. E. F. MACTAGGART expressed some disappointment that Mr. Fitzmaurice had not made any mention in his paper of the great progress which had been made in the manufacture of building boards. The Building Research Station had done a great deal of valuable work on the application of these materials to the construction of both big and small buildings. MR. W. D. SCOTT asked why it was that the use of chemicals as preservatives was not permitted by the Food and Drugs Act; this was surely surprising in view of the large quantities of pharmaceutical specialities consumed annually. Another speaker pointed out that Mr. Lampitt had implied that food laws tended to encourage the production of food of lower quality. He would have thought that the new Act which had recently been passed enabled the consumer to obtain better food than formerly. MR. F. M. POTTER said that the general tendency was towards a healthier, happier nation through improved food and housing, but he asked whether we were not being fed rather too much on scientific and synthetic principles. MR. R. BHATTACHARYA asked whether the palate and taste, peculiar to each individual, had any effect on the growth of different persons.

In reply, DR. L. H. LAMPITT said that he proposed to deal with the questions raised on broad lines. First, he would like to put Mr. H. V. Potter right, for he had not said that we were producing better food, but that this was the ideal for which food chemists were working. As regards the effects of standardisation of food products, it had the great advantage that the quality of the products, such as milk, could be relied upon, and on the whole the public were obtaining better quality goods. In the case of jam, also, anything could be sold as jam before the action taken by a number of manufacturers with the Society of Public Analysts resulting in recipes to be used in the making of jam and a consequent raising of the quality of the product. But for a full fruit jam, a clever manufacturer could so arrange the composition of his product that it contained the amount of insoluble solids required, but not the amount of actual fruit. From this aspect there was a tendency to work down to the lowest limit. There had been reference to synthetic food in the discussion, he would like to point out that there was no such thing as a synthetic foodstuff. He was not in a position to answer the question regarding the efficiency of synthetic drugs in comparison with the natural products, but in his own field synthetic and natural flavourings provided an interesting comparison. For example, an acute palate could detect a difference in flavour between synthetic and natural vanilla. There was something more in natural vanilla besides just flavouring matter; this gave a roundness to the flavour which was lacking in the synthetic product. So far as the effect of palate on growth was concerned, the psychological factor of the way in which food is presented to the consumer was of the greatest importance. As regards the introduction of chemicals into foods, fruit purées sometimes used to arrive from abroad with such a high content of SO_2 as preservative that it was quite impossible to tell whether the fruit was in fresh condition when originally converted into the purée. Under the present food laws, one could tell, owing to the limit put on the SO_2 content, whether the original fruit was in good condition. In this type of case the laws were successful and also, notably, in the restrictions placed upon the claims made in food advertisements.

MR. R. FITZMAURICE, in reply to Dr. Cullen, said that the corrosion of steel in tall buildings was a very serious problem. It was fortunate, however, that when the steel corroded badly it increased in bulk volume, so that the effect could be detected from an examination of the building and action taken before serious accident occurred. He confessed that he omitted to deal with building boards in his paper, as they did not represent a trend of the future, but had already arrived.

Personal Notes

MR. GEORGE ROYDEN, of Uddingston, has been appointed technical assistant chemist to Uddingston Gasworks. For the past seven years he has been engaged at the gasworks as engineer.

DR. S. R. ILLINGWORTH, of Cardiff, has been appointed lecturer in chemistry at Denbighshire Technical Institute. Dr. Illingworth, prior to going to Cardiff, was connected with the research departments of Woolwich Arsenal and the Glico Petroleum Co.

MR. ROLAND L. WEBB, manager of *The Timber Trades Journal*, is leaving London for Sweden to-day. In making this trip he will be following in the footsteps of Sir Ernest Benn, chief proprietor of THE CHEMICAL AGE, and of *The Timber Trades Journal*, who has visited Sweden several times—the last occasion being two years ago when, as president of the Advertising Association, he led 300 to 400 members on the highly successful Advertising Convention to the Northern capitals. With Stockholm as his headquarters, Mr. Webb hopes to visit Gothenburg, Karlstad, Falun, Hernosand, Gavle, Iggesund, Ljusne, Soderhamn and Sundsvall.

OBITUARY

MR. ANDREW A. MEEK, managing director of the Scottish Salt Co., Ltd., Joppa and Prestonpans, died at Prestonpans on September 19.

MR. ARTHUR E. BARFIELD, chairman of Wild-Barfield Electric Furnaces, Ltd., died at his home on September 15, after a short illness.

Fuel in Canada

Statistics of Oil and Coal Consumption

IN 1937 Canada imported 16,000,000 tons of coal, an amount representing close to 51 per cent. of her total apparent consumption of the fuel for that year, while the Dominion's imports of crude petroleum for refining in Canada, and of petroleum products totalled 42,951,400 barrels (Imperial measure), or approximately 93 per cent. of the apparent requirements.

Canada's consumption of fuel and gas oils, the only liquid refinery products that are sold in direct competition with coal, amounted to 15,208,200 barrels in 1936, a new record, and equivalent on a calorific value basis to 3,600,000 tons of high-quality coal. Measured on this basis, sales of fuel oils recorded almost a twofold increase in the five-year period ending 1936, as compared with the similar period ending in 1926, whereas the use of coal and coke showed a decline of 30 per cent.

In 1936, approximately 33 per cent. of the fuel oil sold in Canada was used as bunker fuel; 26 per cent. for industrial purposes; 22 per cent. for the heating of buildings, and domestic use; 10 per cent. for railway use, chiefly as locomotive fuel; and 10 per cent. for oil refinery fuel. As the fuel oil consuming Diesel engine is as yet not used to a large extent in Canada, this distribution is indicative of the employment of fuel oils for purposes that would otherwise be served by coal. The displacement is mainly of Canadian coal, as Ontario, the only province that imports most of its coal requirements, accounted for only 21 per cent. of the consumption of fuel oils other than refinery fuel in 1937.

OIL Mill and Varnish Works Oleum has been founded at Bresc on Bug, Poland, with a capital of 10,000 zloty.

British Overseas Chemical Trade in August

According to the Board of Trade returns for the month ended August 31, 1938, imports of chemicals, drugs, dyes and colours were valued at £1,086,536, as compared with £1,123,554 for August, 1937, a decrease of £37,018. Exports were valued at £1,675,687, as compared with £1,870,809, a decrease of £195,122. Re-exports were valued at £32,230.

Imports

	Quantities. August 31, 1937.	Quantities. August 31, 1938.	Values. August 31, 1937.	Values. August 31, 1938.
Acids—				
Acetic .. .. cwt.	7,773	7,299	8,563	8,891
Boric (boracic) ,,	8,892	3,150	9,655	3,519
Citric .. .. ,,	960	1,015	3,822	4,092
Tartaric .. ,,	2,038	1,510	9,249	6,987
All other sorts .. value	—	—	7,421	6,063
Borax .. .. cwt.	30,816	7,497	18,999	5,642
Calcium carbide .. ,,	125,965	110,051	66,026	50,015
Fertilisers, manufactured—				
Superphosphate of lime tons	—	5	—	16
All other descriptions ,,	3,258	3,102	20,074	16,800
Potassium compounds—				
Caustic and lyes cwt.	9,129	11,479	8,793	13,244
Chloride (muriate) ,,	219,200	378,104	74,825	128,077
Kainite and other potassium fertiliser salts cwt.	88,840	131,852	17,337	25,906
Nitrate (saltpetre) ,,	6,295	6,196	4,864	4,905
Sulphate .. ,,	164,160	188,440	75,182	86,564
All other compounds ,,	8,818	7,034	11,034	9,755
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	368	—	371	—
Chromate and bichromate .. .. cwt.	3,974	1,194	4,305	1,487
Cyanide .. ,,	4,176	1,809	9,531	4,728
Nitrate .. .. ,,	30,383	157,306	7,066	36,135
All other compounds ,,	21,644	16,972	16,941	16,418
Chemical manufactures value	—	—	309,952	269,346
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. .. oz.	78,650	152,318	6,556	13,702
Medicinal oils .. cwt.	2,620	3,821	7,971	10,011
Proprietary medicines value	—	—	71,139	64,138
All other sorts .. ,,	—	—	49,421	33,383
Finished dye-stuffs obtained from coal tar cwt.	2,838	3,072	87,452	88,359
Extracts for dyeing ,,	4,591	4,129	10,760	8,295
Extracts for tanning (solid or liquid)—				
Chestnut .. cwt.	15,599	19,983	11,630	14,520
Quebracho .. ,,	25,674	7,009	23,624	5,692
All other sorts ,,	24,651	27,903	16,298	23,239
All other dyes and dye-stuffs .. .. cwt.	787	493	13,662	10,693
Painters' and printers' colours and materials—				
White lead (basic carbonate) .. cwt.	5,924	6,185	9,652	8,479
Lithopone .. ,,	22,778	22,972	14,772	14,079
Ochres and earth colours cwt.	19,002	22,121	6,642	8,445
Bronze powders and other metalic pigments .. cwt.	1,863	1,585	14,637	11,881
Carbon blacks .. ,,	39,030	30,412	55,660	42,228
Other pigments and extenders, dry cwt.	37,313	43,069	8,888	9,899
All other descriptions ,,	17,221	10,647	30,780	20,903
Total .. .. value	—	—	1,123,554	1,086,536

Exports

	Quantities. August 31, 1937.	Quantities. August 31, 1938.	Values. August 31, 1937.	Values. August 31, 1938.
Acids—				
Citric .. .. cwt.	2,410	2,267	11,355	10,475
All other sorts .. value	—	—	26,377	21,780
Aluminium compounds tons	2,648	2,493	32,008	21,768
Ammonium compounds—				
Sulphate .. tons	22,761	22,069	141,552	148,520
All other sorts ,,	917	1,584	11,684	20,470
Bleaching materials—				
Bleaching powder (chloride of lime) .. cwt.	71,777	45,000	17,318	11,994
All other sorts .. ,,	5,073	3,642	9,902	9,491
Coal tar products—				
Cresylic acid .. galls.	224,909	106,056	39,988	14,465
Tar oil, creosote oil ,,	954,540	2,319,198	27,931	50,736
All other sorts .. value	—	—	16,497	11,801
Copper, sulphate of tons	1,722	722	35,852	12,091
Disinfectants, insecticides, etc. .. .. cwt.	35,380	28,912	73,653	59,814
Fertilisers, manufactured tons	32,293	17,751	83,583	66,904
Glycerine .. .. cwt.	4,277	9,006	19,943	30,114
Lead compounds .. ,,	11,662	13,088	19,755	17,668
Magnesium compounds tons	511	399	12,182	10,582
Potassium compounds cwt.	6,588	2,551	11,731	9,367
Salt (sodium chloride) tons	18,262	21,219	48,682	53,875
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	416,423	281,696	90,334	63,271
Caustic .. .. cwt.	236,634	171,753	97,831	83,240
Nitrate .. .. ,,	2,244	1,054	1,199	424
Sulphate, including salt-cake .. cwt.	139,586	29,989	12,315	4,689
All other sorts .. ,,	86,160	66,499	93,436	77,937
Zinc oxide .. tons	1,119	1,057	24,706	18,718
All other descriptions value	—	—	201,139	197,026
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts oz.	314,493	130,013	32,420	14,102
Proprietary medicines value	—	—	123,580	101,516
All other descriptions ,,	—	—	132,787	144,943
Dyes and dye-stuffs and extracts for dyeing and tanning—				
Finished dye-stuffs obtained from coal tar—				
Alizarine, alizarine red and indigo (synthetic) cwt.	2,318	123	14,071	1,113
Other sorts .. ,,	6,137	4,471	77,076	71,056
Extracts for tanning (solid or liquid) cwt.	17,801	23,727	16,387	22,502
All other descriptions ,,	1,939	1,593	12,628	6,184
Painters' and printers' colours and materials—				
Ochres and earth colours cwt.	8,999	10,634	8,930	11,041
Other descriptions ,,	17,914	17,914	27,650	30,918
White lead .. ,,	6,137	3,566	13,983	7,281
Ships' bottom compositions .. .. cwt.	3,442	3,314	13,183	11,188
Paints and painters' enamels .. .. cwt.	40,100	40,702	108,944	106,683
Varnish and lacquer (clear) .. galls.	62,222	65,533	24,707	26,466
Printers' ink .. cwt.	4,116	3,993	21,653	18,678
All other descriptions ,,	40,930	39,077	80,857	74,896
Total .. .. value	—	—	1,870,809	1,675,687

Re-Exports

	Quantities. August 31, 1937.	Quantities. August 31, 1938.	Values. August 31, 1937.	Values. August 31, 1938.
Chemical manufactures and products .. value	—	—	24,260	16,991
Drugs, medicines and medicinal preparations cwt.	—	—	10,088	9,873
Dyes and dye-stuffs and extracts for tanning cwt.	180	367	531	4,285
Painters' and printers' colours and materials cwt.	312	651	658	1,081
Total .. .. value	—	—	35,537	32,230

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Inorganic

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Permeability of papers to liquids and fats. Bekk, *Zellstoff u. Papier, 18,* 462-469.

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Permeability of stainless steels. Krivobok, *Metal Progress, 34,* 223-229.

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Adherent nickel plating. Halls, *Metallurgia, 18,* 139-140.

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Oils and fats from waste products. Foulon, *Seifensieder Ztg., 65,* 626-628.

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Tanning with sulphite cellulose extracts. Belavsky, *Collegium,* No. 817, 209-215.

Drying and air conditioning. *Ind. Eng. Chem., 30,* 995-1010.

From Week to Week

EMPLOYMENT WILL BE PROVIDED for an extra 300 men with the now completed third development at the Lochaber power works of the British Aluminium Co.

THE IRON AND STEEL INSTITUTE and the Institute of Metals have postponed their tour to Canada and the United States. The party should have sailed on September 17.

A SERIES OF TEN LECTURES on "The Recent Chemistry of the Fats," will be given by Professor T. P. Hilditch, on Wednesday evenings at the Liverpool Technical School, commencing January 11, 1939.

THE SCOTTISH CO-OPERATIVE WHOLESALE SOCIETY states that trade in the chemical sundries department for the past nine months showed an increase of £22,057 compared with the corresponding period of last year.

THE TOTAL VALUE OF DIRECT INVESTMENTS in Canada in 1936 in business enterprises controlled in other countries was $2,716,000,000, but in these companies there were Canadian minority interests totalling $457,000,000.

EXPORTS FROM CANADA in August amounted to $83,469,000, against $101,471,000 in August, 1937. The share of the United Kingdom was $26,736,000, against $35,727,000 a year ago, and that of the United States $39,602,000, against $44,122,000.

ARRANGEMENTS HAVE BEEN COMPLETED for the opening of the discussions of the papers to be submitted at the Fifth National Road Transport Conference to be held at Birmingham, October 3 to 5 inclusive.

THE TELEPHONE NUMBER OF UNO PRODUCTS was, owing to a printer's error, wrongly given in the company's advertisement on page viii of the September 10 issue. The correct telephone number is Livingstone 2186.

LEEDS CORPORATION ELECTRICITY COMMITTEE have received two reports by Professor J. W. Cobb, Livesey professor of coal gas and fuel industries at Leeds University, dealing with the new boilers and the electrostatic dust precipitator plant installed at Kirkstall Power Station. For some time past complaints have been received from people living in the Kirkstall district about the dust nuisance created by the power station.

LAST YEAR WAS THE BEST that the china clay industry of Cornwall and Devon has known. There was a turnover of 969,299 tons, but this year's figures so far show such a considerable falling off that it is necessary to go back six years to discover a lower total. German imports of china clay have been well maintained this year, and at the end of July that country stood second only to the United States.

DELEGATES FROM TWENTY-FIVE COUNTRIES, including Great Britain, attended the fourth International Conference on Timber Utilisation, which concluded its sitting in Brussels on September 17. It was stated that the annual total production of timber was now valued at 25,000,000,000 gold francs and that the trade now occupied fourth place in the world. Speakers included Mr. E. H. B. Boulton, technical director of the Timber Development Association of Great Britain.

SIR WILLIAM BRAGG, president of the Royal Society, opened the Sir Robert Hadfield Metallurgical Laboratories at the Applied Science Department of Sheffield University, on September 14. The new extensions and improvements, which were built at a cost of £30,000, represent the first stage in a scheme of development for which an appeal for £250,000 was launched two years ago. Sir Robert Hadfield, chairman and managing director of Hadfield's, Ltd., Sheffield, gave £10,000 of the £30,000 required and equipped one of the research laboratories at a cost of £2,000.

BENJAMIN ELECTRIC, LTD., have issued a booklet which has been compiled on novel lines to deal with the subject of industrial lighting. They have selected from their files a number of photographs and against each they have entered brief notes outlining the requirements which lighting has to meet in each situation, followed by a short note descriptive of the illustration shown. In the case of chemical works it is stated that the recommended intensity is 5-10 foot-candles, and the requirements are well diffused lighting with particular attention to the machines. The lamps, moreover, should be protected and the fittings kept clean.

OF THE 743 REGISTERED PREMISES IN MANCHESTER where offensive trades are carried on, six are used for soap boiling, two for tallow melting, three for oil distilling, three for fat melting, nine for the spreading of rubber paste or solution, two for size making, and two for the maufacture of rubber substitute. The annual report of the Medical Officer of Health, submitted to the September meeting of the Manchester City Council, has a section dealing with offensive trades, in which it is stated that a petition was received from 24 householders with regard to smells which were alleged to come from a works where shellac bleaching took place by immersion in open vats containing boiling sodium hypochlorite solution. Observations, however, failed to reveal any nuisance from this source.

THE MANUFACTURE OF MARGARINE IS TO BE STARTED at the new industrial estate at Hillington, Glasgow. For this purpose a new private company—Cardonald Margarine Works, Ltd.—has been registered.

CLASSES IN CHEMICAL ENGINEERING started at the Liverpool Technical College on September 19. This course has been modified to meet the needs of students who wish to sit for the examinations of the Institution of Chemical Engineers.

JOHN LYSAGHT, LTD., of Normanby Park Steelworks, Scunthorpe, are closing down their mid-Lincolnshire ironstone mines at Greetwell, Lincoln, at the end of this month. In future they will draw their main supplies from Nettleton Top, near Caistor.

THE LARGEST GLASS RESEARCH DEPARTMENT in this country, will be opened by Sir William Bragg, president of the Royal Society, at the works of Pilkington Bros., St. Helens, on October 5. Over forty research experts, in charge of Dr. H. Moore, formerly director of the British Scientific Instrument Research Association, will staff the new department.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

South Africa.—H.M. Trade Commissioner at Johannesburg reports that the Union Tender and Supplies Board is calling for tenders (Tender No. S.O. 917) for the supply and delivery to the Department of Mines of a portable corundum crushing and grading plant complete with primary and secondary crushers, screening plant, prime movers, etc., together with trailers and a tractor for transporting the plant. Tenders endorsed "Formal Tender No. S.O. 917" should be addressed to the Secretary, Union Tender and Supplies Board, 271 Visagie Street, P.O. Box 371, Pretoria, by whom they will be received up to 9 a.m. on October 13, 1938. Local representation is essential, and the Department of Overseas Trade is prepared to furnish firms desirous of tendering for the supply of plant of United Kingdom manufacture, and not represented in South Africa, with the names of United Kingdom merchant houses with local connections who may be willing to handle tenders.

Palestine.—A firm in Jerusalem wishes to obtain the representation of United Kingdom manufacturers and exporters of pharmaceutical and toilet preparations, cement, paints, fertilisers. (Ref. No. 196.)

Sweden.—A firm of agents established at Stockholm wishes to obtain the representation of United Kingdom manufacturers of lubricating oil and other petroleum products for Sweden. (Ref. No. 206.)

Forthcoming Events

London.

September 16-October 1.—The Building Exhibition, Olympia.

September 29-30.—International Council of Tanners. Annual Conference. Leathersellers' Hall.

October 3-7.—International Shoe and Leather Fair.

October 3.—Society of Chemical Industry (London Section). Burlington House, Piccadilly, W.1. 8 p.m. Dr. R. Lessing, "The Development of a Process of Flue Gas Washing without Effluent."

October 5-15.—Inventions Exhibition.

Hull.

October 4.—Hull Chemical and Engineering Society. Builders' Exchange, Metropole, West Street. 7.45 p.m. G. Wright, "The Craftsman in Modern Industry."

Norwich.

September 27.—Institute of Chemistry (East Anglia Section) Norwich Technical College. 7.30 p.m. W. Lincolne Sutton, "Water Supply—with Special Reference to East Anglia."

Oxford.

September 21-26.—International Conference for Documentation. Lady Margaret Hall, Oxford.

Ten Years Back

From "The Chemical Age," September 22, 1928

A non-inflammable celluloid has resulted from research following on the fusion of the Celanese Co., and the Celluloid Corporation in New York.

* * * *

Eighty-five British delegates who had been taking part in the annual meeting of the Society of Chemical Industry in New York arrived home on Monday.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

MAGNETIC ALLOY.—T. Hamilton-Adams. 26788.

THERMAL DECOMPOSITION OF ALUMINIUM CHLORIDE, ETC.—A. S. Burman. 26801.

SULPHOCARBOXYLIC ESTERS OF ALCOHOLS of higher molecular weight, etc.—F. J. Cahn, and M. B. Katzman. (United States, Sept. 29, '37.) 26725.

PREPARATION OF POLYAZODYESTUFFS, ETC.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. (France, Sept. 14, '37.) 26763.

COLOURING OF ALUMINIUM ARTICLES, ETC.—Coventry Chromium Plating Co., Ltd., and C. G. Tysoe. 26352.

METHOD OF PROGRESSIVE PURIFICATION OF BIOLOGICALLY IMPURE LIQUID, ETC.—C. J. Dekema. (Union of South Africa, July 30.) 26680.

PRODUCTION OF POLYSTYRENE BODIES.—Dow Chemical Co. (United States, Oct. 6, '37.) 26824.

MANUFACTURE OF BENZIDINE.—E. I. du Pont de Nemours and Co. (United States, Sept. 11, '37.) 26635.

DISPERSIONS OF HIGH-MOLECULAR COMPOUNDS, ETC.—E. I. du Pont de Nemours and Co., A. M. Alvarado, and G. L. Dorough. 26279.

MANUFACTURE OF DIMORPHOLINE COMPOUNDS.—J. R. Geigy, A.-G. (Switzerland, June 10.) 26799.

MANUFACTURE OF ACYLAMINO-MORPHOLINE COMPOUNDS.—J. R. Geigy, A.-G. (Switzerland, June 11.) 26800.

MANUFACTURE OF MAGNESIUM ALLOYS.—G. von Giesche's Erben. (Germany, Sept. 21, '37.) 26702, 26822.

MAGNESIUM ALLOYS.—G. von Giesche's Erben. (Germany, Sept. 21, '37.) 26823.

MANUFACTURE OF MORDANT DYESTUFFS of the dioxazine series. W. W. Groves (I. G. Farbenindustrie.) 26239.

PRODUCTION OF SLIVER from artificial fibres.—W. W. Groves (I. G. Farbenindustrie.) 26678.

PROTECTION OF MAGNESIUM RICH ALLOYS.—High Duty Alloys, Ltd., and F. A. Allen. 26684.

PRODUCTION OF METAL SECTIONS.—High Duty Alloys, Ltd., and J. A. Heron. 26685.

TREATMENT OF FOODSTUFFS.—G. W. Hommel. 26788.

MANUFACTURE OF AZODYESTUFFS.—I. G. Farbenindustrie. (Germany, Sept. 8, '37.) 26282.

MANUFACTURE OF SULPHONIC ACID AMIDE COMPOUNDS.—I. G. Farbenindustrie. (Germany, Sept. 8, '37.) 26283.

CONTINUOUS PURIFICATION OF CARBON DISULPHIDE.—I. G. Farbenindustrie. (Germany, Nov. 27, '37.) 26409.

Complete Specifications Open to Public Inspection

PROCESS FOR MANUFACTURING SYNTHETIC RESIN COMPOUNDS.—J. B. Monier. March 8, 1937. 28308/37.

LAMINATED RUBBER.—Wingfoot Corporation. March 12, 1937. 31718/37.

REFINING PETROLEUM DISTILLATES.—Standard Oil Development Co. March 6, 1937. 35732/37.

PROCESS FOR THE MANUFACTURE OF THIAZOLES unsubstituted in the 2-position.—F. Hoffman-La Roche and Co., A.-G. March 12, 1937. 4077/38.

PREPARATION OF PALE PAINT, varnish, and enamel vehicles.—Resinous Products and Chemical Co. March 6, 1937. 5101/38.

PREPARATION OF PALE COLOURED ALKYD RESINS.—Resinous Products and Chemical Co. March 6, 1937. 5102/38.

PRODUCTION OF SYNTHETIC RESINS.—Albert Products, Ltd. March 8, 1937. 5119/38.

METHOD OF MANUFACTURE OF ALUMINA.—J. C. Seailles. March 6, 1937. 6285/38.

MANUFACTURE OF POLYMETHINE DYESTUFFS.—I. G. Farbenindustrie. March 6, 1937. 6410/38.

ISOLATION OF STEROLS.—Parke, Davis and Co. March 12, 1937. 6685/38.

MANUFACTURE OF AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. March 8, 1937. 6824/38.

STEROL DERIVATIVES and process of making same.—Parke, Davis and Co. March 12, 1937. 6840/38.

PRODUCING SYNTHETIC PEPPERMINT OIL.—Hittel Ges. March 9, 1937. 7077/38.

PREPARATION OF DISAZO DYESTUFFS.—Chemical Works, formerly Sandoz. March 8, 1937. 7107/38.

PREPARING VISCOUS OILS, such as lubricating-oils, transformer oils, and the like.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. March 12, 1937. 6034/38.

MANUFACTURE AND USE OF ARTIFICIAL RESINS.—Deutsche Hydrierwerke, A.-G. March 6, 1937. 7125/38.

CORROSION-RESISTANT AUSTENITIC NON-MAGNETIC STEEL ALLOYS. Vereinigte Oberschlesische Huttenwerke, A.-G. March 11, 1937. 7385/38.

TREATING AND STORING ORGANIC LIQUIDS containing substances tending to form peroxides.—Carbo-Norit-Union Verwaltungs Ges. March 12, 1937. 7659/38.

Specifications Accepted with Dates of Application

SYNTHESIS OF HYDROCARBONS from carbon monoxide and hydrogen.—Synthetic Oils, Ltd., and W. W. Myddleton. Dec. 8, 1936. 491,778.

TREATMENT OF SUPERPHOSPHATE or fertiliser containing same.—Davison Chemical Corporation. Dec. 11, 1935. 491,841.

MANUFACTURE OF PURE CELLULOSE from cellulose-containing materials.—M. Gunther. Jan. 28, 1936. 491,842.

DIESEL FUELS.—Standard Oil Development Co. Feb. 7, 1936. 491,648.

WASHING OUT OF HYDROCARBONS from gases.—G. W. Johnson (I. G. Farbenindustrie.) Feb. 5, 1937. 491,657.

COMPOUNDED LUBRICATING-OIL.—Standard Oil Co. of California. Feb. 7, 1936. 491,594.

COMPOSITIONS OF MATTER containing film-forming polymeric esters and ethers.—W. H. Moss. March 4, 1937. 491,792.

MANUFACTURE AND PRODUCTION OF AZO DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie.) March 4, 1937. 491,793.

MANUFACTURE OF SINTERED HARD ARTICLES containing metallic carbides.—Rheinmetall-Borsig, A.-G. March 6, 1936. 491,722.

SEPARATION OF ANTI-RACHITICALLY-ACTING COMPONENTS of irradiated 7-dehydrocholesterol.—K. Merck, L. Merck, W. Merck, and F. Merck (trading as E. Merck (firm of)). March 6, 1936. (Samples furnished.) 491,653.

MANUFACTURE OF ALUMINIUM SALTS of carboxylic acids.—W. W. Groves (A.-G. für Stickstoffdünger). March 6, 1937. 491,661.

MANUFACTURE OF CYCLOPENTANOHYDROPHENANTHRENE KETONES.—W. W. Groves (I. G. Farbenindustrie.) March 8, 1937. 491,798.

MANUFACTURE OF DERIVATIVES of cyclopentano polyhydrophenanthrene.—W. W. Groves (I. G. Farbenindustrie.) March 8, 1937. 491,799.

MANUFACTURE AND USE OF ACRYLIC ACID ESTERS and polymerisation products thereof.—Rohm and Haas, A.-G. March 7, 1936. 491,800.

DEPOLYMERISATION AND HYDROGENATION OF NATURAL, SYNTHETIC, AND VULCANISED RUBBER.—G. L. Hugel. March 9, 1937. 491,850.

PROCESS FOR THE MANUFACTURE OF SULPHONIC ACID AMIDE COMPOUNDS.—A. Carpmael (I. G. Farbenindustrie.) March 9, 1937. 491,925.

UREA-ALDEHYDE RESINS.—A. Hill, E. E. Walker, and Imperial Chemical Industries, Ltd. March 9, 1937. 491,857.

PRODUCTION OF ALIPHATIC CARBOXYLIC ACIDS.—A. Imhausen, and C. Staennings (trading as Markische Siefen-Industrie.) March 10, 1936. 491,927.

MANUFACTURE OF CHROMIFEROUS DYESTUFFS.—I. G. Farbenindustrie. March 11, 1936. (Samples furnished.) 491,862.

MANUFACTURE OF SODIUM HYDROSULPHIDE.—I. G. Farbenindustrie. April 23, 1936. 491,863.

PRINTING CELLULOSIC MATERIALS.—D. P. Milburn, and Imperial Chemical Industries, Ltd. March 10, 1937. 491,931.

POLYMERISATION OF MONO-OLEFINES.—A. Carpmael (I. G. Farbenindustrie.) March 11, 1937. 491,932.

MANUFACTURE OF ALKALI METALS.—Imperial Chemical Industries, Ltd. March 11, 1936. 491,879.

ELECTROLYTIC MANUFACTURE OF ALKALI METALS.—Imperial Chemical Industries, Ltd. March 11, 1936. 491,880.

ESTERS OF ACRYLIC ACID and polymerisation products thereof. Rohm and Haas, A.-G. March 12, 1936. 491,894.

PRINTING NN'-DIHYDRO-1 :2 :2' :1'-DIANTHRAQUINONEAZINE DYESTUFFS.—A. Davidson, S. T. McQueen, and Imperial Chemical Industries, Ltd. March 12, 1937. 491,896.

APPARATUS FOR CARRYING OUT POLYMERISATIONS CONTINUOUSLY.—G. W. Johnson (I. G. Farbenindustrie.) March 25, 1937. 491,739.

DETERGENTS.—Colgate-Palmolive-Peet Co. April 29, 1936. 491,815.

MANUFACTURE AND PRODUCTION OF SYNTHETIC TANNING AGENTS. G. W. Johnson (I. G. Farbenindustrie.) April 20, 1937. 491,817.

MANGANESE STEEL.—Firth-Sterling Steel Co. March 31, 1937. 491,673.

PRODUCTION OF OPAQUE PROTECTIVE COATINGS ON ALUMINIUM and its alloys.—M. Scheuk. July 13, 1936. 491,618.

PRODUCTION OF ARTICLES by pressing and/or rolling from zinc base alloys and articles so produced.—National Smelting Co., Ltd. Aug. 26, 1936. 491,905.

MANUFACTURE OF CARBONIC ACID DERIVATIVES.—Soc. of Chemical Industry in Basle. Dec. 24, 1936. 491,638.

MANUFACTURE OF ASBESTOS CEMENT PRODUCTS.—Turner and Newall, Ltd. Jan. 23, 1937. 491,830.

VULCANISATION OF RUBBER.—Wingfoot Corporation. May 15, 1937. 491,643.

Commercial Intelligence

Mortgages and Charges

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

RICHARD THOMAS AND CO., LTD., London, W.C., steel tinplate manufacturers. September 8, £660,000 4½ per cent. redeemable prior lien debenture stock, part of a series already registered. * £8,620,410. August 11, 1938.

Companies Winding-up Voluntarily

THE FOLDAL COPPER AND SULPHUR CO., LTD. (C.W.U.V., 24/9/38.) By reason of its liabilities, September 12, 1938, D. N. Forbes, 11 Old Jewry, London, E.C.2, appointed liquidator.

CORNISH KAOLIN, LTD. By Special Resolution, September 12, 1938, Godfrey Anderson, 20 Copthall Avenue, London, E.C.2, appointed liquidator.

Release of Trustees

MASON, George, Whitworth, Ingsfield, White Lee Road, Batley, soap and chemical manufacturer. William Foy Cresswell, Hallfield Chambers, 71 Manningham Lane, Bradford. September 1, 1938.

New Companies Registered

Sorbon Laboratories, Ltd. 344,148.—Private company. Capital, £1,000 in 200 preference shares of £1 and 16,000 ordinary shares of 1s. each. To acquire the business of a manufacturing chemist now carried on by Charles Knott at 20c Pimlico Road, S.W.1, as "Sontay Laboratories." Directors: Charles Knott, 122 Holland Road, Kensington, W.14; John N. Taylor; Leslie Crane.

Commercial Chemical Research, Ltd. 344,385.—Private company. Capital £100 in 100 shares of £1 each. To undertake research work, investigations and reports, develop new industries and carry on the business of research, analytical and manufacturing chemists, etc. Directors: Maurice D. Curwen, B.Sc., 174 Grove End Gardens, N.W.8; Samuel J. Hartnett, George W. Johns. Registered office: Westmorland House, 127-131 Regent Street, W.1.

Chemical Markets

LONDON.—With a more hopeful outlook in the European political situation business in the chemical markets has been transacted with less hesitancy than was displayed during the previous week. Actually, the volume of inquiry for industrial chemicals for spot or near delivery requirements is reported to be quite good. So far as the price position is concerned the general tone is steady, the only alteration of note being an advance of £1 per ton in the convention quotations for lead oxides; this rise follows the recent advance in the price of the metal. There has been no appreciable improvement in the demand for coal tar products although a slightly better interest has been displayed in some directions notably in toluol and crude benzol and quotations for most products are firmer in tone.

MANCHESTER.—Although quotations are mostly steady on the Manchester chemical market business has been on a comparatively slow scale during the past week, with buyers showing little disposition to operate much beyond early needs so far as the leading heavy products are concerned. With regard to contract deliveries, the position in most sections is better than it was a month ago, but traders complain still of the generally quiet demand for textile chemicals. Cresylic acid has displayed fresh easiness and business has been slow, but in most other respects the price position of the by-products has been fairly well maintained, with pyridine a trifle better on a slight improvement in buying interest.

Company News

A. Boake, Roberts and Co., announce an interim of 1 per cent. net on the ordinary shares.

Greeff-Chemicals Holdings announce a half-yearly dividend on 5½ per cent. cumulative preference stock units, payable September 30.

William Briggs and Sons announce a half-yearly dividend on 5½ per cent. "A" cumulative preference shares and 6 per cent. "B" cumulative preference shares payable on September 30.

International Paint and Compositions Co., Ltd., is maintaining its ordinary interim at 4 per cent., less tax, payable September 30. Last year the final was increased from 12 per cent. to 16 per cent. The usual 3 per cent. dividend is announced on the preference shares.

Imperial Chemical Industries have declared, as at September 27, 1938, in respect of the trading year ending December 31, 1938, an interim dividend of 3 per cent. actual on the issued ordinary stock of the company. This dividend will be payable (less income tax at 5s. 2d. in the £, being United Kingdom Income Tax at 5s. 6d. in the £, less Dominion Income Tax relief at 4d. in the £), on November 1, to stockholders on the register on September 27. For the purpose of the payment of the dividend, transfers are to be lodged at the company's registered office not later than September 26.

Chemical and Allied Stocks and Shares

THE decreased tension in international affairs has resulted in a firmer undertone in all sections of the stock and share markets, and since the commencement of the new Stock Exchange account on Monday share values have recovered the losses shown last week when industrial and other securities were marked down sharply in price.

Shares of chemical and kindred companies reflected the better trend of markets. Imperial Chemical have improved from 29s. 6d. to 29s. 10½d. at the time of writing, aided by the maintenance of the interim dividend at 3 per cent. Turner and Newall have moved up 2s. to 75s., while British Oxygen are 69s. 4½d. compared with 67s. 6d. a week ago. British Aluminium have improved 6d. to 49s. 3d., assisted by the interim dividend, which is being maintained at 4 per cent. despite the larger capital in issue.

Associated Portland Cement were steady at 75s., pending declaration of the interim payment, while British Plaster Board were moderately better in price. Wall Paper deferred units were slightly lower at 35s. awaiting the past year's results, which are expected to be issued towards the end of next month. Murex at 76s. 3d. show an improvement of 1s. 3d., and Tube Investments were moderately better at 77s. 9d. The market remains hopeful of a larger dividend from the latter company, but estimates of the payment do not exceed 25 per cent. Tecalemit ordinary shares were again fairly active, dividend estimates also being a factor in this case. Pinchin Johnson, which declined to below 25s. at one time, have since recovered to 26s. 6d. which is slightly higher than the price ruling a week ago.

United Steel ordinary units have risen from 22s. 3d. to 24s. as a result of the raising of the dividend to 10 per cent., which exceeded general market estimates by 1 per cent. The full results are being awaited with considerable interest. Hadfields, Vickers and numerous other iron, steel and kindred shares also made better prices, as did Dorman Long and Consett Iron. Colvilles improved slightly, although the disposition is to await the interim dividend announcement, which falls to be made next month. Staveley and Sheepbridge shares were firmer in advance of the annual meetings of these companies, and Stewarts and Lloyds, Baldwins, and Guest Keen and Nettlefolds ordinary shares showed moderate gains.

Triplex Glass ordinary were more active and are better at 27s. 9d., partly owing to news that extensions are to be made to the company's works, but United Glass Bottle and most other shares of glass companies were dull. Borax Consolidated failed to hold an earlier improvement. General Refractories have been lowered to 9s. 6d. on the decision not to make an interim dividend payment.

B. Laporte transferred around 85s., and Fison Packard and Prentice ordinary shares were also reported to be more active, although at 33s. 9d. the price is 1s. lower than a week ago. Boots Pure Drug remained firm, and have improved 9d. to 40s. 3d. at the time of writing, the assumption in the market being that there are good prospects of the company maintaining its dividend and cash bonus distributions at the same rates as for the previous year. Sangers were steady at 22s. 3d., as were Timothy Whites and Taylors at 24s. 3d. Lever and Unilever ordinary units responded to the tendency of markets, while Swedish Match and International Nickel were better.

"Shell," Anglo-Iranian and other leading oil shares have also moved in favour of holders. Burmah Oil improved on the assumption that the forthcoming interim dividend is likely to be kept at 5 per cent.